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A PECULIAR NUCLEAR SAFRANIN REACTION AND ITS RELATION TO THE CARCINOMA COCCIDIA QUESTION.

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The employment of a large number of chemical reagents is one of the unfortunate necessities of modern microtomy. No one can become familiar with the long list of substances employed in microscopical research, nor with the bewildering combinations of fixing agents and staining agents, without realizing the possibility of many of these substances being used without a definite knowledge of their effects. The history of microscopic anatomy is full of instances, in which the results of some pioneer investigator have been attacked, on the ground that the results which he obtained were the effects of the reagents employed in the study. In fact, it is even now not uncommon to have the question of the reagent effect brought up, when intricate microscopical studies are being prosecuted. Without doubt, the suspicion that many of the marvellous findings of the cytologists are the products of unknown micro-chemical changes, is still entertained by many individuals.

The controversy between Henle,[1] Flemming,[2] and others, concerning the nuclear fragmentation observed in leucocytes and pus corpuscles, is a notable instance of the skepticism relating to the interpretation of microscopical findings. Henle maintained that the multi-nuclear condition of leucocytes and pus corpuscles was the result of the acetic acid, or other reagent, used in studying these bodies. This view was strongly opposed by Flemming, who observed multi-nuclear leucocytes in various situations in living objects, and who further noted that no change was produced in these cells by killing them with acetic acid, save that the nuclear structure became more apparent.

Every histologist will remember the discussion which arose when the discovery of the reticulated condition of the protoplasm of the cell and nucleus was announced; a considerable number of investigators arraying themselves on the side which maintained that the reticulum was either a faulty optical interpretation, or was the product of the changes induced by the chemical substances employed in the technique. But Flemming and his followers apparently put the subject at rest, by not only demonstrating the nuclear and cytoplasmic reticulum, but also by following the processes of direct and indirect nuclear division in *living tissue*; these observations being made by the aid of the most perfect optical appliances.

While the employment of reagents is a prime necessity of microscopical technique, it is nevertheless a fact, that such reagents produce a variety of compounds with each other and with the substances of the tissue, the exact natures of which are either unknown, or but imperfectly understood. It follows then, that until our knowledge of ultimate micro-chemical cellular and nuclear reactions be complete, we must regard with a reasonable skepticism, many of the startling microtomical novelties of the day.

The open questions in this connection are many. What is the exact nature of that part of the so-called chromatin of the nucleus, which retains certain anilin stains when employed by the "indirect method?"[3] What is the effect of the fixing medium on this chromatin? What is produced by the combination of the nuclear chromatin and fixing agent, which allows a certain dye to stain precisely, and another one to fail? Many queries of this character confront the microtomist at every turn, and impress him with the profound character of the many unsolved biological problems. It cannot be said, however, that the absorbing subject of the micro-chemistry of staining agents, particularly the anilins, has been entirely neglected; for the work of Ehrlich[4] and his students on the reactions of leucocytes, and "mastzellen," indicate the tendency to investigation in this direction.

In this connection also, may be mentioned the work of Auerbach,[5] Watasê,[6] and others, on the two chromatin substances which are distinguished by their micro-chemical and staining reactions. These authorities go so far as to indicate the *sexuality* of the two nuclear substances; the erythrophile, being the preëminently male constituent, and the cyanophile, essentially female. Manifestly, such work opens a wide field for research, the bearings of which must be felt in every department of biological or pathological investigation.

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Among the many staining substances employed in the new microtomy as inaugurated by Böttcher and Hermann and improved by Flemming, one, safranin, has come into very extensive use. When employed after the "indirect" or Flemming method, safranin gives a precise chromatin stain, which compares in color and durability with carmine. The solutions of safranin in common use are two, viz., the alcoholic

[1] Henle. Zur Entwicklung der Krystallinse und zur Theilung des Zellkerns. Arch. f. Mik. Anat., Band 20, p. 413, 1881.

[2] Flemming. Zellsubstanz, Kern und Zelltheilung, Leipzig, 1882, p. 348.

[3] A. B. Lee. The Microtomist's Vade Mecum. Second edition, London, 1890, p. 55.

[4] Farbenanalytische Untersuchung zur Histologie und Klinik des Blutes. Gessamm. Mittheil., v., P. Ehrlich, I, 1891.

[5] Ueber einen sexuellen Gegensatz in der chromophilie der Keimsubstanzen neiderer Wirbeltheire. Von Prof. Dr. L. Auerbach. Aus Sitzungsberichte der königl. preussichen Wissenschaften zu Berlin.

[6] On The Phenomena of Sex-differentiation. S. Watasê. Jour. Morphology, VI, No. 3, 1892.

(Pfitzner's and Flemming's), and the anilin-water (Babes, Zwaardemaker). It is very necessary that the safranin employed be of the right quality and in this respect the products of Grübler meet all requirements: his "safranin spirituslöslich" being adapted for the alcoholic solutions, and the "safranin wasserlöslich" for the anilin water solutions. These staining solutions can only be employed with sections of tissue; and it is further true, that safranin only gives its best result in sections of tissues which have been fixed in a chromic acid mixture. The practice of safranin staining consists in allowing the section to attain an over-stained condition in the coloring solution, and then washing out and fixing the stain, then clearing the dehydrated section, and mounting it in balsam. A variety of agents have been employed in the washing and fixing of the safranin, as acidulated alcohol (Flemming[7]), strong picric acid alcohol (Podwyssozki[8]), iodine after Gram's method (Prenant[9]), and chromic alcohol (Martinotti and Resegotti[10]).

The action of the hydrochloric acidulated alcohol, or plain alcohol, when employed in washing out, seems to be merely a solvent one. The excess of stain dissolves in the spirit, and the remainder is held by the nuclei, which apparently have the greatest affinity for the color. With chromic acid, or iodine, however, the effect seems different, as suggested by Lee,[11] who considers it probable, that these agents have a sort of "mordant" action on the nuclear chromatin, inducing in it a marked affinity for the staining material. In this connection it is important to direct attention to the fact, that chromic acid, picric acid and iodine, all possess the property of precipitating safranin from its solutions. The experiment may be tried by adding a drop of the washing and fixing mixture (chromic acid solution, picric alcohol or iodine solution) to a drop of the safranin solution on a glass slide; here the precipitation may be carefully observed by the aid of the microscope. In the case of the chromic acid solution, an amorphous yellowish precipitate is instantly produced when a drop is brought into contact with the safranin mixture. With an alcoholic iodine solution. *a mass of deep red, needle-shaped crystals is produced immediately.* When picric acid alcohol, and anilin water safranin solution are mixed, the precipitation is much more tardy; but sooner or later, a crystalline deposit may be observed *which resembles very closely that produced by iodine and safranin.* All of these deposits are soluble in alcohol.

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In a modified method recently proposed, Heidenhain[12] advises the employment of tincture of iodine in treating the sections of tissue fixed in corrosive sublimate, previous to staining, with the object of removing the crystals of sublimate which often remain in the tissue. This process consists in treating sections of paraffine imbedded tissue, which have been fixed on the slide, and previously treated by xylol and alcohol, with strong tincture of iodine. After the iodine has acted ten or fifteen minutes, the section is washed in changed alcohol, and is then ready for any kind of staining.

While engaged in the preparation of some frog's tissue after Heidenhain's method, which was to be stained in safranin, I made the mistake of placing the section in the staining solution (Pfitzner's alcoholic safranin mixture) before it had been treated with the tincture of iodine. It occurred to me to try the tincture of iodine *after* the safranin, in the hope of still being able to remove the sublimate crystals.

The first section on which the procedure was tried was from the heart of the frog, which had been stained for twelve hours in the safranin. The iodine tincture was applied to the section immediately on its removal from the staining solution, and was allowed to act for two or three minutes. A brief washing with 95 per cent. alcohol followed, by means of which the excess of stain was removed and the section dehydrated. The object was cleared with clove oil, and mounted in xylol balsam.

On examining this section of the frog's heart, microscopically, I was struck by the remarkable appearance presented by the tissue. Under the low power (Leitz objective 3), the appearance of the section at first sight resembled that of precise safranin staining when carried on after usual methods; *i.e.*, the nuclei were prominent by their deep stain, while the ground substance appeared nearly unstained. More careful observation even by the low power, demonstrated a peculiar granular appearance in the nuclei, as something entirely unusual. On employing a higher power (Leitz objective 8), the nature of the granular appearance of the nuclei became more apparent. The nuclei of the heart muscle were exceedingly prominent, because of the presence in their interior, of irregularly arranged, deep red stained masses, quite distinct from the usual chromatin framework of such nuclei. At first superficial examination it seemed as if all the nuclei of the heart muscle were undergoing the process of karyokinesis, particularly, as some of the red stained masses assumed attitudes not unlike certain chromatic figures of indirect nuclear division. This idea was dismissed, however, on closer observation; for aside from the many usual shapes presented by these intra-nuclear bodies, it was noticed that the usual stages of karyokinesis were not reproduced, and that the nuclear membrane was always intact. The idea of the bodies being bacteria presented itself, but was at once abandoned, because of their irregularity in size and shape, and because of their constant presence within the nucleus.

A more prolonged study, and particularly with the aid of the twelfth inch oil immersion lens, brought out the characteristic features of these safraninophile masses. Their prominence was due to the intensity of their deep red color which allowed them to stand in relief, even when strong substage illumination was employed, as is the case with well stained bacteria in tissue, and with nuclear figures. The shape of these bodies exhibited all variations from the nearly spherical, to the rod-like; and the bodies were sometimes single and again thrown together in masses. The rod or stick-like forms predominated, and these varied greatly in their dimensions; and some exhibited blunt round ends, while others were pointed, or "lance-like." Undoubtedly, the variety of shapes was in part due to the relation of the bodies to the plane of the optical section. A little ingenuity in comparison would have made it easily possible to describe

7 Zeit. fur. Wiss. Mik., I, 3, 1884, p. 350.
8 Beitrg zur path. Anat., I, 1886.
9 Int. Monatschrift fur Anat., IV, 1887, p. 358.
10 Zeit. fur. wiss. Mik., IV, 3, 1887, p. 328.
11 Loc. cit. p. 58.
12 Ueber Kern und Protoplasma. Festschr, Albert von Koelliker, Leipzig, 1892.

among these bodies such forms as "lance-like," "whetstone-like," "sickle-like," "boat-like," and "button-like." The number of these formations in a nucleus, varied from half a dozen, to twenty or more; some nuclei showing but a few, others being entirely filled with them. The size varied from minute granules, to long masses which equaled and sometimes exceeded in length, the diameter of the nucleus. The color of the formations, as indicated above, was a homogenous deep reddish brown. Occasionally a mass of rod-like forms gave a yellowish or brownish reflex with strong illumination.

Figure 1 gives an idea of the variety in shape, size, and arrangement of the forms in question, and represents fairly well the deep color and its contrast with the pinkish hue of the nucleus proper.

More extensive study of the section with the high powers, brought out several interesting facts. In many muscle nuclei containing the safraninophile objects, the ordinary chromation framework with its nucleoli could be detected by its faint pinkish color. Many nuclei of the muscular tissue were also noted, in which the pink chromatin framework was visible, but which contained none of the deep red bodies in question.

In the red blood corpuscles of this preparation, the peculiar formations occurred in some of the nuclei, but here the uniformity observed in the muscle nuclei was absent; and it was further observed that the safraninophile bodies when present, were much smaller than in the muscle. In fact, it may be here remarked, that the described formations bore a very constant relation to the size of the nucleus in which they were found. Often the nuclei of the red blood cells appeared a homogeneous deep red color; again, they appeared entirely filled with fine red granules; and finally many nuclei could be seen in which the deep red bodies appeared distinctly visible on a pinkish background. A pink chromatin network could occasionally be seen in the nuclei of the blood corpuscles. The three red corpuscles in Fig. 2, show the variations in the nuclear contents.

The leucocytes in the sections from the frog's heart prepared by the safranin-iodine method, usually exhibited a faint pink nuclear network, it being only exceptional to find nuclei containing the deep red safranin bodies.

A number of sections from the same piece of tissue were stained in the above described manner, and they uniformly showed these strange nuclear contents. Several control sections were cut from the same piece of tissue, stained in the same safranin solution, but washed in alcohol acidulated with hydrochloric acid (1 to 1000); and in these sections the bodies were never found, but the nuclei only presented the ordinary chromatin pictures.

As these remarkable appearances were noted, a number of queries arose as to the nature and significance of the strange intra-nuclear bodies. Were these striking forms a normal structure of the nucleus brought out by this peculiar staining combination? Were they artificial products of some combination of the reagents employed? If so, were they produced by a combination of the sublimate and iodine and colored by the safranin; or were they the result of the iodine and safranin reaction? To answer these questions, I proceeded to make a number of experiments on sections from a variety of animal tissues prepared with various fixing and staining combinations. The normal tissues studied, were from the salamander, frog, snake, turtle, cat, dog, sheep, pig, ox, and man. The pathological tissue was mostly from carcinomata and sarcomata. The objects from these sources had been fixed in Flemming's solution, Hermann's solution, absolute alcohol, and corrosive sublimate (Heidenhain's solution). In all cases in which the safranin-iodine stain was employed, control sections were stained with safranin, gentian violet, or other stain, after the common methods.

As a summary of these experiments, I may say that it was possible to produce the characteristic safranin bodies in all of the tissue, no matter what its source, or in what medium it had been fixed. That is to say, the safranin-iodine staining combination developed the deep red formations in sections of tissue fixed in Flemming's solution, Hermann's solution, and absolute alcohol, the same as in sublimate fixed tissue. The only difference to be noticed in the effects produced by the fixing agents, was that the ground stain in sections of tissue from an osmic acid fixing solution, was of a more brownish hue, in contra-distinction to the pink ground color of the sublimate sections. This was particularly true of tissue which had remained long in the osmic fixing mixture.

While it was always possible to demonstrate the deep red bodies in some portion of a section, none of my subsequent preparations gave the remarkably uninform appearance of the nuclei of the heart muscle of the frog. Many times the nuclei of one portion of a section were either unstained or showed the normal chromatin framework, while the nuclei of another portion would contain the safraninophile masses. It was particularly noted that the nuclei about the borders of a section seemed to retain the safranin bodies most persistently. In some sections also, dark brown spots, visible to the unaided eye occurred, and on examining these spots microscopically, they were found to be composed of a dark red mass of safranin bodies which resembled very closely those found in the nuclei. Again it was noted, that the safranin bodies were not always confined to the nuclei,even in sections showing none of the large masses; for in many preparations they occurred in the cell protoplasm. Concerning this diversity in the amount and situation of the formations, it was found that it depended upon the duration of the washing with alcohol which followed the staining; a short washing leaving many of the bodies, and a more prolonged washing making them less numerous, and more precisely confined to the nucleus. As in ordinary anilin staining, a stage could be reached with prolonged washing, in which all stain could be removed from the section.

As stated above, the size of the safraninophile bodies varied with the size of the nucleus; and in the same degree the shape of the individual forms seemed to vary, so that, instead of the preponderance of the rod or stick-like forms of the frog's heart muscle, an indescribable number of shapes often presented themselves.

With regard to the behavior of the various tissue elements, besides the fact already mentioned, that the peculiar condition could be produced in the nuclei of all the tissue studied, I will only direct especial attention to the reaction of the non-nucleated red blood corpuscles of mammalian tissue. In normal tissue fixed in Flemming's solution, and

stained by the safranin-iodine combination, the red blood corpuscles usually assumed a uniform brownish tint, and the *safraninophile bodies were often found in their interior.* The significance of the observation will appear later.

Several experiments with various solutions were made, and it was found that the peculiar reaction could be produced in sections stained in Babe's anilin-water safranin, as well as with the alcoholic solution. The most perfect result was obtained when strong (U. S. P.) tincture of iodine was allowed to act a minute or two. Weaker solutions of iodine in alcohol did not act so perfectly, though the safranin bodies were still formed if the iodine was permitted to act longer. In the few experiments I made, it was impossible to produce the characteristic appearance when safranin stained sections were treated with an aqueous solution of iodine and iodide of potassium.

My conclusion as to the nature of these safraninophile bodies is that they are *artificial crystalline products, the result of a safranin and iodine reaction.* That their production is in no way due to sublimate fixation, as at first surmised, is clear from their occurrence in tissue fixed in other media. I believe them to be of a crystalline nature, not only because of their resemblance to crystals when examined with high powers, but also from the fact that crystals of similar appearance may be produced by mixing safranin solution and tincture of iodine on a slide, as previously mentioned. The fact that these crystals are soluble in alcohol would account for the varying appearance presented with the varying duration of the washing process, following the staining.

The remarkable affinity of these crystalline safranin bodies for the nuclei, seems to me due to the fact, that the nuclear chromatin naturally attracts the stain most strongly, and retains it most persistently; and it is in the nucleus, therefore, that the safranin-iodine reaction is most intense, the production of crystals most pronounced; and the nucleus is that portion of the tissue from which the crystals would be last dissolved in the washing out process.

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At the time in which I had made the observations on the safranin-iodine crystals, I was deeply interested in the investigations relating to the etiology of carcinoma, and it was at this time that the contribution of Podwyssozki and Sawtschenko[13] came to my notice.

This work is of much importance in connection with the carcinoma organism question, not only on account of the high scientific reputation of the principal author, but also because of the very positive manner in which these investigators argue for the presence of coccidia in a variety of carcinomata examined by them.

After reviewing the literature of the subject, Podwyssozki proceeds to describe his own investigations, and claims to have found certain intracellular bodies in twenty cases of carcinoma examined by him, which he can interpret only as true sporozoa.

The technique which gave the best results to these authors, consisted in fixing the tissue in Flemming's solution, staining in anilin-water safranin, and washing in *picric acid alcohol.*

The bodies described as coccidia were round or oval forms, of varying size, usually of a brownish tint, and containing in their interior safraninophile "nuclear" substance. It is upon the presence of the safraninophile substance in these bodies that the authors lay the greatest stress, and in the varying relations and situations of these deep red particles, the writers interpret the different developmental stages of the coccidia. Of especial importance is the presence of "sickle-formed" and "spindle-formed" red masses, in the bodies which they designate coccidia; and bodies filled with these "sickle-formed embryos" they consider as ripe individuals especialy diagnostic of coccidia or sporozoa. Certain masses or conglomerations of the round or oval bodies with safranin "nuclear" substance, and usually found in the lymph spaces of the carcinoma, are looked upon as spore cysts. Aside from the method of propagation by spores, a form of direct division is suggested, in which a mass of "nuclear substance" is found at each pole of a coccidium.

These investigators remark that the only tissue element which assumes a brownish tint similar to the so-called sporozoa, in carcinoma tissue fixed in Flemming's solution and stained by the safranin-picric acid method, is the red blood corpuscle; but the feature which distinguishes their coccidia-like cells from the red blood cells, is the *presence of the safraninophile substance in the coccidia, and its absence in the blood corpuscle.*

In a paper published some time previous to that of Podwyssozki and Sawtschenko, Stroebe[14] examined some fifty tumors, mostly carcinomata and sarcomata. He fixed his tissue in Flemming's solution, and stained the sections in safranin, then washed them in alcohol acidulated with hydrochloric acid, and finally with *alcohol to which picric acid was added.* In studying these preparations he noticed, aside from the usual chromatin network, homogeneous, round or oval bodies, containing deep red formations of a "lancet" form, "whetstone" form, and "navicelli" form, which were often seen singly and again in masses. Stroebe was uncertain as to the significance of the cells containing the dark red particles, though he evidently inclines to the opinion that they are parasitic forms. From his plate, which is unfortunately uncolored, it is seen that the safraninophile bodies of various shapes, sometimes occur in the nuclei, and again in the cell protoplasm. In Fig. 7 he shows a cell with a nucleus in mitosis, in the protoplasm of which two darker segments occur with "sickles" or "navicelli" forms. In Figs. 8, 9 and 10, he shows "vacuoles" pushing the nucleus aside and containing in their interior the irregular chromatic particles.

Podwyssozki inclines to the view that the forms described by Stroebe are probably identical with his coccidia, and he believes that since Stroebe did not find the cells filled with "sickle-formed embryos" which he regards as so positively characteristic, he was not able to take a positive stand.

Without going further into a discussion of this subject, which has so many tempting aspects, I will proceed to a brief description of my own studies.

Even before I had made preparations after Podwyssozki's method, I was struck with the resemblance of some of his figures to the safranin-iodine crystals

[13] Podwyssozki und Sawtschenko. Ueber Parsitismus bei Carcinomen nebst Beschreibung einiger in den Carcinomgeschwülsten schmarotzenden Sporozen, Cent. f. Bak. u. Parasiten., XI, Band. No. 16, 17, 18, 1892.

[14] Stroebe. Zur Kentniss verschiedener cellularer Vorgange und Erscheinungen in Geschwulsten. Beitrg. z. path. Anat. u. z. Allgem. Path., 11 Band, Heft. 1, 1891.

found in normal tissue. A reference to his beautiful plates, VII and VIII, showed in the first place. that many of the nuclei of the epithelial cells contained deep red, irregular masses, quite distinct from the lighter red of the chromatin proper. Among the inclusions, it was noted that the stained masses in their interior, exhibited the peculiar dark red color, and the diversity of shape, so characteristic of the safranin-iodine crystals. Particularly convincing in this respect were the safraninophile particles in the inclusions in Figs. 16, 17, 18, 19, 20, 25, 26 and 27, and also in the masses in the lymph spaces, in Figs. 21, 22 and 24.

I now proceeded to study some sections prepared after the process advised by Podwyssozki, employing tor this purpose some carcinoma tissue which had been carefully fixed in Flemming's solution. For want of well fixed tissue, it has not been possible for me to extend my experiments as far as seems desirable; but in the half a dozen carcinomata from various sources, and in a well preserved piece of rapidly growing osteo-sarcoma, kindly furnished me by Prof. Van Hook, the results were quite uniform, so that, it seems to me, they should be judged qualitatively, and not quantitatively.

The sections of the parrafin imbedded tissue were fixed on the slide, stained with Babe's anilin-water safranin, washed in picric acid alcohol, cleared in clove oil and mounted in balsam. Other sections from the same pieces were stained in the safranin, and washed with tincture of iodine, followed by alcohol. Others still were stained in safranin, and washed with alcohol acidulated with hydrochloric acid; or they were stained with gentian violet, after Bizzozero's method.

One of the first objects studied was from a carcinoma of the larynx, and in sections of this tumor, prepared as advised by Podwyssozki, I was surprised to find in many of the nuclei, particularly at the border of the section, *safraninophile bodies which appeared identical with those produced by the safranin-iodine reaction*, These bodies occurred not only in the nuclei of epithelial cells, but also in the nuclei of the other tissue elements. Their color was the familiar brownish-red of the safranin-iodine crystals, and the size and shape of the bodies varied in the same manner as has been described. In the epithelial cells, the "lancet-like" forms predominated, and these were present either singly or in heaps.

In Fig. 5 is seen a group of epithelial cells from one of the sections of the carcinoma of the larynx, and it gives a good idea of the appearance of a group of cells in which these bodies are plentiful; though it was rare to find so many neighboring cells in a single preparation, showing the safranin bodies.

Fig. 6 shows four cells from the small-celled infiltration, in the same section as the above, two of which present well defined lanceolate safraninophile bodies.

The three large cells in Fig. 7 were found in another section of the same tumor, in a portion which appeared to be degenerating. From their surroundings, I am inclined to regard these cells as pus corpuscles, or other degenerating cells, containing the usual deep red masses. Particular attention should be directed to the shape of the safraninophile bodies in this figure as corresponding with Podwyssozki's "button-like," "crescentic," "sickle-like" and "navicelli" particles.

Upon discovering these safranin bodies to be produced by the safranin-picric acid method, I extended the staining method to sections of other carcinomata, and to sections of normal tissue. It was found that while the peculiar red particles were not invariably present in a section stained after Podwyssozki's process, they did occur occasionally in the sections, both of carcinomata and of normal tissue. So that it is clearly a fact, that brownish-red safranin bodies of a variety of forms are not found in carcinomata alone, when the safranin-picric acid stain is employed.

For the sake of comparison, sections from the same pieces of tissue as those employed in the last experiments were stained by the safranin-iodine method. Here the usual safraninophile particles were produced, and so far as microscopical appearances were concerned, the resemblance between these crystals and the bodies occurring in the safranin-picric acid stained sections was so great, as to lead me to the opinion that they were similar in nature. That is, that in both cases, the peculiar deep red formations were of a *crystalline nature, and the result of the safranin-iodine or safranin-picric acid reaction*. This opinion gained additional weight from the fact that it was possible to demonstrate a crystalline precipitate when safranin solution and picric alcohol were mixed, directly. It was observed also, in referring to this experiment in another part of this paper, that the production of the precipitate by safranin and picric acid was much more tardy than in the safranin-iodine reaction. This, it seems to me, would explain the preponderance of the safranin-iodine crystals, and the relative scarcity of the crystals of the safranin-picric acid reaction.

I regret not having had the opportunity, up to the present time, of extending my studies over a considerable amount of well fixed carcinoma tissue, because, for this reason, I cannot speak with confidence of a number of Podwyssozki's findings in this communication, which therefore, must be regarded in the light of preliminary report. Particularly is this true of the intra-cellular cysts containing safraninophile particles, for I must confess, that my search for such bodies as shown in many of Podwyssozki's figures has been poorly rewarded. Nevertheless, the deep red particles of "sickle-form," "spindle-form," "half-moon" form, and other forms described by these authors, and upon which so much stress is laid, bear so great a resemblance to the artificial safranin crystals of my experiments, that I cannot do otherwise than regard them as identical. Another point upon which I lay much stress is the presence of illy-defined deep red particles in the *nuclei of some of the epithelial cells* of Podwyssozki's figures, which he has so faithfully portrayed. If one of the deep red intra-nuclear particles were transferred to an intra-cellular cyst, it would make a safraninophile body precisely identical with many of those he has figured. As an example, the deeply stained particle in the nucleus of the epithelial cell in Fig. 17, plate 8, resembles in every way the "sickle-formed" chromatic bodies in the larger inclusion in the same cell.

I have encountered the heap-like collections of cells with safranin particles, which are designated "spore cysts" by Podwyssozki, in several of my preparations; particularly in those portions which were degenerating. Such masses I have regarded as leucocytes, and the deep red particles as safranin-picric

acid crystals. Many such leucocytes undoubtedly contain ingested chromatin, from cells which have degenerated. In Fig. 24, plate 8, Podwyssozki represents a mass of "sporozoa" occupying the place of an epithelial cell, which, according to his idea, has degenerated. If we recall Noeggerath's [15] observations on the relations of leucocytes to carcinoma, wherein he describes very accurately the manner in which wandering cells take up the dispersed chromatin of degenerating carcinoma cells, and in which he mentions the possibility of leucocytes filling the devoured cell, then this figure of Podwyssozki's could be explained. His "sporozoa" would become leucocytes filled with particles of dispersed chromatin,aside from that which belonged to them naturally. This would account for the irregular arrangement and variety of color of the contained safraninophile particles. Aside from this, the fact that these leucocytes contained an excess of chromatin would naturally make them attract more safranin, and thus give them opportunity for developing more safranin-picric acid crystals than ordinary leucocytes.

It has been previously stated, that Podwyssozki and Sawtschenko observed that the red blood corpuscles were the only tissue elements which assumed the brownish tint characteristic of the sporozoa, in preparations fixed in Flemming's solution, and stained in anilin-water safranin, and picric-alcohol; but that the absence of safraninophile particles in the red blood cells always distinguished them from the coccidia. In the description of the safranin iodine method, I have referred to the fact that in normal tissue fixed in Flemming's solution, the red blood cells not only were stained a well marked brownish color, but that they also often contained the safraninophile crystals. Extending my studies to carcinoma tissue fixed in Flemming's solution, and stained by the safranin-iodine method, it was often possible to discover red blood cells, both within and without the vessels, of a brownish color, and containing the same safranin bodies observed in the blood corpuscles of normal tissue. Fig. 3, represents a mass of such red corpuscles, and especial attention is directed to the shape and arrangement of the safraninophile bodies, since they resemble so closely some of Podwyssozki's coccidia. Two of the corpuscles contain the chromatic particles at the poles, which calls to mind Podwysszoki's "direct division" of the sporozoa. If the nature of the cells in this figure were not otherwise clear, the corpuscle (*a*) at the right of the heap, which presents a profile view with the usual bi-concavity of red blood corpuscles, would remove all doubt.

But the occurrence of safranin bodies, in the red blood cells, was not confined to Flemming fixed carcinoma tissue stained by the safranin-iodine method; for I was also able to demonstrate similar deep red particles in the blood corpuscles of *preparations stained by the safranin-picric acid method*. Fig. 4, from a preparation of an *osteo-sarcoma* of the humerus, fixed in Flemming's solution, and stained in safranin-picric acid alcohol, shows three red blood corpuscles in a connective tissue space, every one of which contains safranin bodies. In this preparation the nuclei of the sarcoma cells showed a brilliant red chromatin network, which made a strong contrast with the deep brown tint of the blood corpuscles, and the deeper red of their safranin bodies. From these observations it is therefore evident, that the red blood corpuscles, both of the safranin-iodine and safranin-picric acid preparations, *do contain safraninophile substance;* and from my other studies of this subject, I am prepared to assert that the safraninophile substance is an artificial product, and the result of a safranin-iodine, or a safranin-picric acid combination, as the case may be.

This being true, one of the most weighty supports is removed from the arguments of Podwyssozki and Sawtschenko. Now, if red blood corpuscles, leucocytes, and pus corpuscles, can contain the foreign safranin bodies, it is not unreasonable to presume that the blood platelets may also become the seat of similar chromatic formations; and if this be true, it is possible to furnish an hypothesis to account for many of the findings of these investigators. Without entirely committing myself, therefore, I desire to suggest, that many of the included cells with safraninophile particles figured by Podwyssozki, are red blood corpuscles, or blood platelets, or degenerating forms of these cells which have escaped into the tissue, and which have become the seat of artificial deep red precipitates.

Applying the preceding observations to the work of Stroebe, it does not become difficult to conclude that the intra-nuclear and intra-cellular bodies, which excited his curiosity, are closely related to, or identical with, the safraninophile particles produced in my experiments. This conclusion seems justifiable for several reasons. In the first place, Stroebe employed the safranin-picric alcohol stain in his preparations. Then the bodies described by him are decidedly safraninophilous. Their shape and size recalls the safranin-picric acid particles. Finally, the facts are equally suggestive that these safranin bodies occurred free, both in the nuclear and cell substance, and that they were sometimes single and again aggregated into heaps.

In connection with the recent studies on the structure and etiology of carcinoma, it is interesting to note that the question of the reagent effect has been mentioned by Hansemann.[16] In his latest defense of his theory of asymmetrical mitosis, against the attack of Stroebe, Hansemann objects to certain of Stroebe's observations on the ground that the preparations contained *artificial products* which obscured the karyokinetic pictures. In this condemnation Hansemann includes, also, the preparations of Podwyssozki, Coën, and Fischer, which were employed by Stroebe, and he says that while these preparations were doubtless useful for the purpose intended (studies in tissue regeneration) they were not available for studies in irregular mitosis. Now, if the preparations of Stroebe were useless for the study of nuclear phenomena, on account of the presence of foreign products, they certainly should be excluded in the more exacting researches required in determining the nature of the minute cell inclusions, which forms the subject of the work on the carcinoma organism.

The arguments herein presented may be epitomized as follows:

1. A precipitation of deep red material may be produced when the solutions of safranin and iodine, or safranin and picric acid are mixed, directly.

[15] Bietrage zur Strucktur und Entwickelung des Carcinoms. E. Noeggerath, Wiesbaden, 1892.

[16] Ueber die Anaplasie der Geschwulstzellen und die asymmetrische Mitose. D. Hansemann. Virchow Archiv., Bd. 129, Heft 3, 1892.

2. A precipitation of similar deep red material is produced *in tissue*, when safranin and iodine, or safranin and picric acid are employed in the staining process.

3. The precipitate occurs in any of the elements, either of normal or pathological tissue; and may occur either in the nucleus or in the cytoplasm.

4. This artificial product occurs in the cells of sections of carcinoma tissue, prepared as directed by Podwyssozki and Sawtschenko.

5. Therefore, the multiform red particles occurring in the cells of carcinoma tissue prepared by the safranin-picric acid method, are artificial products; and since Podwyssozki and Sawtschenko base their arguments on the presence of these red formations in their so-called "coccidia," their conclusions must be valueless.

It is not my purpose to deny that some of the bodies seen by Podwyssozki and Sawtschenko, and also by Stroebe, may have been sporozoa. Much less do I intend, in this work, to dispute the presence of coccidia in carcinomatous tissue, or to enter upon the question of the possible etiological relation of protozoan microörganisms to these neoplasms. However, since these investigators employed a microtechnical method, which my experiments lead me to believe is a faulty one, because it gives rise to dangerous foreign products; and since they make the bodies which I believe to be foreign, the decisive issue of this work, it can only remain for me to take an opposing attitude.

It certainly seems an opportune moment to point out the errors of Podwyssozki's method; for not only is the work of Podwyssozki and Sawtschenko extensively quoted, and credited; but many investigators are straining their eyes to discover the all important lanceollate, cresentic, semi-lunar, falciform, and "navicelli" bodies; and finding these characteristic formations in carcinoma tissue they must confirm the work of these authorities.

To correct a point which may not have been made altogether clear, I desire to state that it is not my intention to throw discredit on *safranin* as a valuable staining substance, for, when followed by a washing with alcohol aciduated with hydrochloric acid, I believe it gives results which all of our knowledge of staining reactions leads us to believe are reliable. But to follow safranin staining with a subsequent washing with a solution containing iodine or picric acid, I regard as not only unscientific, but positively dangerous.

EXPLANATION OF PLATE.

All of the figures were drawn by the aid of the Abbé camera lucida, with a tube length of 160 mm.; drawing paper on the table. The Abbé sub-stage condensor was employed in obtaining illumination.

Figs. 1 and 2 were made with Bausch and Lomb's one-twelfth inch oil immersion objective (Continental Series), and Leitz ocular 4. The remaining figures were all drawn with the Leitz one-twelfth inch oil immersion objective, ocular 4.

Fig. 1. A group of nuclei from the heart muscle of the frog, representing the appearance of the safranin-iodine crystals as first discovered. The relative size and the shape of the bodies is well shown, together with the contrast of their reddish-brown color, with the pinkish hue of the nucleus proper. The nucleus (*a*) is seen in transverse optical section.

Preparation.—Corrosive sublimate, Pfitzner's safranin, and tincture of iodine.

Fig. 2. Three red blood corpuscles from same section as Fig. 1. The safraninophile particles are seen in the nuclei of the corpuscles. The nucleus (*a*) is nearly filled with a finely granular, deep red mass, giving it an almost homogeneous deep red color. In (*b*) only a few safranin bodies are seen. They present a variety of shapes, which doubtless depend upon the attitude from which the bodies are viewed. In the nucleus (*c*) the bodies are larger and more numerous. These three corpuscles represent approximately well, the difference which was often observed in the nuclei of the tissue elements of a single section.

Fig. 3. A group of red blood corpuscles from a carcinoma of the larynx. Illustrating the brownish tint of the corpuscles, and the deep red of the safranin bodies. At (*a*) is shown a corpuscle which presented a profile view, and which exhibited well defined bi-concave surfaces. The safraninophile particles in (*b*), (*c*), and (*d*), cause them to bear a great resemblance to the "direct division" of Podwyssozki's coccidia.

Preparation.—Flemming's solution, Babe's anilin-water safranin, and tincture iodine. The tissue had remained some days in the Flemmings solution, and the section exhibited a marked brownish tint from the osmic acid staining.

Fig. 4. From a rapidly growing, medullary, osteo-sarcoma of the humorus, showing three red blood corpuscles in the sarcoma tissue, which are distinguished by their brownish color and their deep red safraninophile particles. A number of blood corpuscles were found exhibiting a similar appearance in various portions of this section, which, from their relations, and resemblance to other corpuscles, left no doubt as to their identity.

Preparation.—Flemming's solution, Babe's anilin-water safranin, and *picric acid alcohol*.

Fig. 5. A group of epithelial cells from a carcinoma of the larynx (same tumor as Fig. 3). These cells were found near the border of the section, and their nuclei presented a large number and variety of safranin-picric acid bodies. The excess of the "lancet forms" will be noted.

Preparation.—Flemming's solution, Babe's anilin-water safranin, and picric acid alcohol.

Fig. 6. Four cells from the small-celled infiltration of the same section as Fig 5. A variety of deep red safranin particles are seen in the nuclei.

Fig. 7. From a degenerating portion of the carcinoma of the larynx. Three large cells, showing crescentic, semilunar, falciform, "navicelli," and "button-like" safranin formations. These cells were lying free in a granular detritus which contained fragmenting leucocytes, degenerating carcinoma cells, etc. These cells are doubtless degenerated leucocytes (pus corpuscles); and their contained bodies are safranin-picric acid crystals, since they resemble the safranin-picric acid bodies found in other portions of this section.

Preparation.—Flemming's solution, Babe's safranin, and picric alcohol.

In all cases, the tissue employed in this study was cut in small pieces immediately on its removal from the body, and at once dropped in the fixing solution.

IDEAL SURGERY.

Read before the St. Louis Medical Society.

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Mr. President:—It is plainly apparent to the student of medicine that the practice of modern surgery is wholly unlike the practice which prevailed, and was approved, only a few years ago.

In the light of advanced surgical pathology, bacteriology, and the now more familiar processes of regeneration and repair, modern surgical methods bear but slight resemblance to those that were practiced a very short time ago.

It is furthermore clearly apparent that the whole tendency of modern surgery is to secure ideal results, and at the same time to keep the practice well abreast with the revolution necessitated by the indications discovered through intelligent clinical observation, scientific investigation and experimental research.

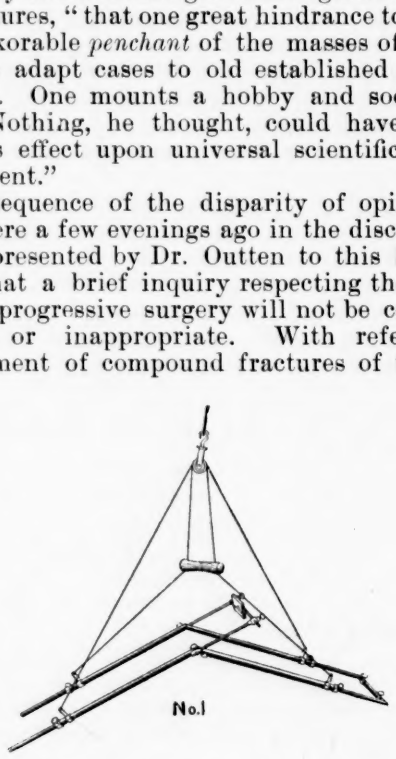
The scope of this modern ideal surgery—it may

be emphatically stated at the outset—does not embrace a rule necessitating the adjustment of a class of cases to a certain mechanical device, in order to secure ideal results; but it does require to act intelligently and institute such methods of treatment as will best serve the purpose in each particular case.

Modern scientific surgery can only contemplate such rules in the light of impediments to its progress, as true science is not and never was dogmatical. The orthodox apparatus must be eliminated from the instrumentarium of the surgeon whose aim is to achieve the ideal of liberal scientific surgery.

I recently heard a distinguished surgeon state in one of his lectures, "that one great hindrance to progress is the inexorable *penchant* of the masses of the profession to adapt cases to old established plans of treatment. One mounts a hobby and soon others follow. Nothing, he thought, could have a more pernicious effect upon universal scientific surgical advancement."

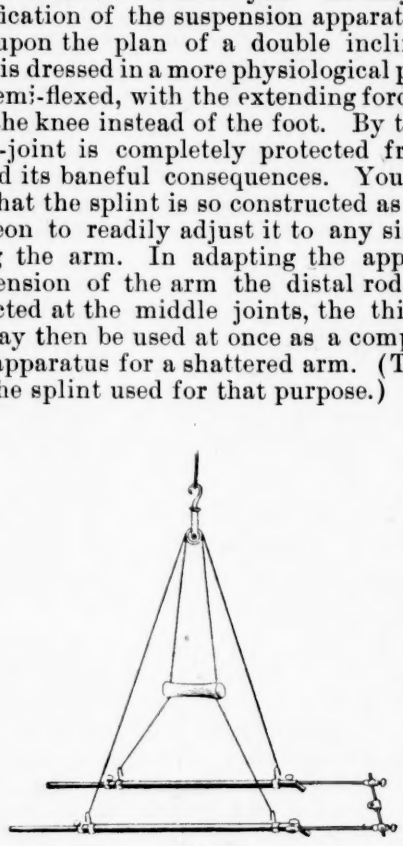
In consequence of the disparity of opinions expressed here a few evenings ago in the discussion of a report presented by Dr. Outten to this Society, I believe that a brief inquiry respecting the present status of progressive surgery will not be considered untimely or inappropriate. With reference to the treatment of compound fractures of the thigh



bone, I wish to reiterate what I then said respecting the use of the Hodgen splint, and which was forcibly illustrated in the case shown here by Dr. Outten. The man's injured extremity got well, it is true, after nearly two years of close confinement; but in consequence of the position in which the limb was kept, the knee-joint became perfectly stiff and unyielding, with also great angular deformity at the site of fracture.

I wish to state here that very soon after I graduated in medicine, I was employed as the chief surgeon of the Wabash Railroad Company, and held that position during eight years. It was after practicing a year or so in this field of surgery, that it became painfully apparent to me that the Hodgen splint proved to be defective in two essential particulars, namely: first, that it did not retain the ends of the broken bone in apposition; secondly, that by applying extension at the foot, and the leg retained in a position nearly straight, there was entailed great impairment of the functions of the knee-joint.

You will bear in mind that Dr. Hodgen himself applied his splint to many of my cases, as he, until the time of his death, was the chief consulting surgeon at this end of the line of that railroad company. The attorneys of that company frequently complained that the assessment of damages against the company for personal injuries was quite as large in consequence of the impaired knee-joint (a condition wholly the effect of the splint), as it was for the injury itself. Actuated by a sense of duty toward my employers, and for the welfare of these patients, about this time I devised and made this splint which I now show you. As may be seen, my modification of the suspension apparatus is constructed upon the plan of a double incline plane. The limb is dressed in a more physiological position—that is, semi-flexed, with the extending force fixed in front of the knee instead of the foot. By this splint the knee-joint is completely protected from overstrain and its baneful consequences. You will also observe that the splint is so constructed as to enable the surgeon to readily adjust it to any sized limb, including the arm. In adapting the apparatus to the suspension of the arm the distal rods must be disconnected at the middle joints, the thigh braces proper may then be used at once as a complete suspensory apparatus for a shattered arm. (This is the part of the splint used for that purpose.)



I exhibited the same to Dr. Hodgen, and he expressed to me his approval of my modification. I continued to use this splint during the years I remained with the company, and no more complaints or excessive demands for compensation were ever made from persons with disabled knee-joints after the treatment of broken thigh bones. (This device, together with an illustration of the splint, were published by Dr. Borck, of this city, in 1879—fourteen years ago.)

Now while this apparatus protects the knee, and in that respect it is a great improvement on the Hodgen splint, nevertheless it is still defective, and does not fully come up to the requirements of ideal surgery. But it was one step in that direction.

Modern surgery received its first impulse at the time when Virchow published his scientific discovery of cellular pathology, in the year 1858.

The demonstration that cells are derived from pre-existing cells came as a revelation to most physicians throughout the world.

The principles of cellular pathology have become to such an extent an integral part of medical thought, that we can hardly estimate, to-day, all that this discovery meant a generation ago.

To do this we must put ourselves back, in thought, to a time when all organized pathological products, pus, tubercle, cancer and all tumors, were supposed to be formed out of a primitive blastema—an exudation of some kind.

Under the influence of such ideas, any coherent or intelligent opinion as to the nature and development of morbid processes would be quite impossible. The never-ending strife between humoralism and solidism would probably be going on to-day had it not received its deathblow from cellular pathology. The ontological conception of disease processes passed out of the horizon of scientific medicine when this discovery was made.

With the recognition of this great discovery, it became clearer than ever before, that the laws in disease are not different from those in operation in health, but are simply subject to different conditions.

The second splendid era of scientific value to the modern surgeon was inaugurated through the labors of the distinguished botanist Schleiden, whose brilliant conclusions, as they were drawn from the study of vegetable histology, were at once extended by Theodor Schwann to the animal kingdom; and then soon followed the demonstration of the migration of the leucocytes from the vessels and of the specific cellular germs of disease; now the inestimable discovery of W. Fleming designated by the term karyokinesis, or the indirect mode of cell reproduction, was published to the scientific world.

Out of those researches the function of the cell, in the process of regeneration and repair, became better understood; and it was soon demonstrated that the function of cell life includes, in a condition of perfect health in the matured body, the normal waste incident to the increasing activity of the tissues; and is balanced by the reparative process, while during the development of the body, an excess of material is added.

From a surgical aspect, cell reproduction or regeneration observed in the healing of wounds produced by severe injuries, and the complete or partial restoration of parts damaged or destroyed by this, and various destructive inflammatory processes caused by the presence of specific pathogenic microörganisms, is a study essential to secure ideal results in the practice of surgery.

There is no doubt existing now in the proposition, that an injury, defect, or the loss of considerable substance, will be repaired from proliferation of preëxisting cells, which compose the structure sustaining the injury, defect or loss of substance. The fixed tissue-cells at the site of injury being endowed from earliest embryonal life with intrinsic power of adaptation to existing conditions surrounding them, assume active tissue proliferation; and the embryonal cells thus produced constitute the granulation tissue, which toward the completion of the healing process, is transformed into mature cells, representing the injured parent tissues which have undergone the reparative process.

The third era, constituting the simple conception, the basis of early antiseptic procedure in surgery, that a wound to which bacteria gain access becomes infected in the same way that a sterilized infusion of meat undergoes putrefaction when a single suitable germ enters, has, it is true, been greatly modified; but the establishment of this truth even before its complete demonstration and the introduction of wound treatment based upon it, must remain forever the merit of the immortal Lister. It is the knowledge of the "how" to obtain aseptic healing of wounds, that has revolutionized surgical practice and made *modern ideal surgery possible.*

Soon the fourth era of this brilliant evolution in the progressive stages of scientific surgery began to take form. It was not long after cell life was cleverly understood until Metschnikoff and others, by certain methods of scientific investigation, demonstrated the fact, that the living tissues were not passive breeding places for bacteria, but that they were able to offer a very considerable resistance to the growth of microörganisms. This discovery was a great boon to the surgeon, for by it he was emancipated from the superstitious dread attending a particular surgical procedure where, from unsurmountable circumstances, the *débridement* is unavoidably imperfect and a limited number of bacteria gain access to the wound.

It is owing probably to this fact of phagocytosis that many cases of imperfect asepsis in surgical operations often heal well. It has been demonstrated by Cheyne and others that doses of less than 18,000,000 of the proteus vulgaris when injected into the muscular tissue of a rabbit seldom cause any result, and it requires as large a number as 250,000,000 to produce a circumscribed abscess.

But of course the condition of the serum, together with the macrophagi and microphagi at the point at which the organisms are arrested, is also a matter of great importance. Tissues which have been damaged by injury, bad surgery, or defective surgical appliances, are not so resistant to the action of bacteria as when in a state of health. A healthy peritoneum may receive and absorb a large number of bacteria; but if damaged during a laparotomy, so that a considerable portion of its absorbing surface has been impaired, and at the same time considerable oozing of blood and serum has taken place from the injured surfaces, a soil favorable for the growth of the organisms is produced and a septic peritonitis may result, even though the operative procedure in other respects may have been conducted under an ordinarily intelligent aseptic detail. Tense sutures also are more likely to be followed by stitch abscesses than where the suture margins are so coaptated as not to destroy the chemotactic properties of the leucocytes and other elements concerned in phagocytosis.

In the light of these discoveries we have learned that suppuration means a destructive process, the significance, and remote effects of which, can only be fully appreciated, by the surgeon, whose best efforts are exercised in behalf of humanity, and the *ideal* of scientific work; suppuration itself means microbial action upon healthy tissue elements, in which *leucocytes and embryonal cells are converted into pus corpuscles.* And it has for some time been known, that long continued suppuration of a wound produces amyloid degeneration of organs remote from the seat of suppuration; that is, by the accumulation of the ptomaines of pus microbes, coagulation necrosis may be produced in other organs of the body, and amyloid degeneration as a consequence.

Hence, after prolonged suppuration the patient can never hope to regain his former functional vigor, therefore the importance of preventing or arresting all suppurative action.

Senn long ago made the assertion that pus microbes are the immediate and essential cause of suppuration, inflammation and pus formation; and no one has as yet been able to successfully contradict

that assertion. So that the etiological explanation, of wound infection, and suppuration, is based wholly, upon the presence, and action of the pyogenic bacteria and their ptomaines.

The chief aim, and object, of ideal surgery, is to prevent suppuration, and secure the healing of a wound, by the first intention, and without suppuration. In a wound where there has been so much loss of substance, as to prevent a proper approximation of the parts, it must of necessity heal by granulation. In the ideal treatment of wounds, the classification into "open" and "subcutaneous" wounds, there is no longer the same practical importance, as an open wound is at once placed under the same favorable conditions for satisfactory and rapid healing, as a subcutaneous wound. It was stated here by several gentlemen who took part in the discussion of Dr. Outten's paper, that an open wound must be exposed to frequent inspection, and that it must also have drainage tubes passed through it.

The fundamental principle underlying ideal wound treatment, as I have stated, consists in preventing suppuration. To prevent suppuration in an open wound, the wound and its environment must be kept aseptic. I do not believe that any progressive surgeon will attempt to deny the force and truth of this assertion.

The indications to be met in a compound fracture of the thigh, for example, are first, the disinfection of the entire wound and its environment; second, the approximation of all the structures implicated as near as possible to their normal anatomical relations, *i.e.*, bone to bone, periosteum to periosteum, muscle tendon and nerves to muscle tendon and nerves, skin to skin, and direct fixation, over which is applied a thick hygroscopic dressing, then immobilization. If these indications have been completely fulfilled, the dressing should not be disturbed for from four to five weeks. *This is ideal surgery.*

When the profession can realize that fractures must be treated in the same manner, as the soft parts, in order to secure union by the first intention, then and not till then, will humanity have ceased to suffer from the surgery of dogmatism. The traditional methods, which depend upon provisional callus, in the union of a broken bone, have no place in modern methods.

The orthodox apparatus which demands the adjustment of all cases to any antiquated system, and necessarily to defective notions, has been eliminated from the instrumentarium of ideal surgery.

There is no longer any room for argument against the danger involved and the unsurgical system of treating wounds by the open method. That era belongs to the past and to history, a practice which modern surgery looks back upon with horror; a wound treated in a manner that constantly exposes it to infection and consequent suppuration and amyloid degeneration of other organs, receives no consideration from ideal surgery. As to the use of the drainage tube, I cannot express my own views more forcibly, than in the words of the celebrated surgeon and author, Thomas Bryant, of London, who said, "I always regret to see a rubber drainage tube passed through a wound; it may be through a joint, or through a *thigh*, or stump; such a drainage tube is a seton, and is not necessary." If a drainage tube through a wound in the thigh acts like a *seton*—as this distinguished surgeon says it does—then the surgeon who places it there may be held responsible for the baneful sequence of long continued suppuration.

Roswell Park, of Buffalo, who is not only a great surgeon but also a pathologist of world-wide fame, stated before the congress of American Surgeons two years ago, "That drainage is mainly practiced from habit or from fear. The promiscuous practice of drainage is a confession of fear or weakness; both of which are unscientific and unfortunate." I might multiply evidence in this direction, but to an intelligent body of scientific men it would seem superfluous. As suggested, when discussing Dr. Outten's case, the favorable progress and termination of such a wound, depends almost wholly upon how perfectly the wound has been purified and the first dressing applied. By "purifying" is meant securing a most thoroughly aseptic condition, by cleansing the entire interior of the wound in every nook and recess of possible infection; and in order that the wound may be rendered perfectly free from microbial contamination, it may be necessary, at varied intervals, to allow the patient a few whiffs of an anæsthetic, that the work may be properly performed without great pain. After securing this moderate degree of anæsthesia, the surface of the limb from the abdomen to the toes is thoroughly shaved and washed with hot water and brush. If grease or other filth of this nature from machinery is found in the wound, rubbing with sweet oil or with turpentine and alcohol before scrubbing with soap and water, greatly facilitates complete asepticism. Wounded vessels must be tied, all parenchymatous oozing stopped, blood clots and foreign particles removed, divided muscles, tendons and nerves sutured, the ends of the fragments trimmed, if necessary, and destroyed tissues cut away. This work completed, the wound is now thoroughly irrigated with hot solutions of first sublimate and then chloride of zinc. The latter penetrates the tissues and acts as a stimulant to the disabled structures; besides it possesses well known germicidal properties. The ends of the broken bone may now be approximated and fixed by wire sutures or ivory nails or some such device. In the event that there has been loss of bone substance, Bercher suggests the implantation of a solid bone cylinder adequate to compensate for the loss.

Senn, the pioneer of bone surgery, appreciating more completely than perhaps many others the scientific value of cultivating the implantation of even a foreign substance in bone in order to fill up a space made vacant by any loss of substance, wires a hollow bone cylinder between the ends of the shattered bone, thus imitating nature as perfectly as possible; and the healing process proceeds upon the same principle, so beautifully illustrated in the healing of wounds, beneath a moist blood clot, first brought into practical utility by the renowned Schede. Even though a muscle, a nerve, or a tendon, may have sustained a considerable loss of substance, by the violence producing a compound fracture, and the ends cannot be properly approximated, they must be sutured, just the same. Large cat-gut sutures, must be used for the purpose, and several sutures introduced; these suture strands, will serve as a "false work" over the breach, upon which the embryonal cells, may construct a more substantial bridge, gaining thereby almost perfect *restitutio in integrum* and the attainment of a perfect functional result will be secured in a short time; otherwise the muscle, nerve or ten-

don having sustained the loss of substance, will retract, and their ends heal by granulation and cicatrization with almost total loss of functional activity, as in Dr. Outten's case. An efficient external support is applied to the thigh and this together with the dressings are allowed to remain for several weeks. If death of any portion of the injured tissues takes place, it will be *aseptic death*, and no harm can follow. Thus, *ideal results are achieved, and the ideal of scientific progress consummated*, and the further advance toward that which we should all desire the most, namely, the *prevention of deformities, the relief of suffering humanity, and the prolongation of human life and usefulness.*

The special points in the foregoing remarks that I wish to emphasize, may be epitomized in the following brief conclusions:

1. That by the development of cellular pathology the process of cell proliferation, and the discovery of the laws of repair and regeneration, and the introduction of Lister's antiseptic system, the principles underlying the practice of surgery have undergone a complete revolution within the last few years.

2. That the principles of scientific surgery are so intimately interwoven with the advances in bacteriological pathology, that a progressive knowledge of the latter is essential, in order to be able to intelligently appreciate its value, in practical surgery, or to comprehend the principles upon which ideal surgery is founded.

3. That the observation made by Cabot, "That every surgical operation is an experiment in bacteriology," proves to be full of wisdom.

4. That the merely antiseptic era has been passed by modern surgery and the trend of the surgery of the future is to purely aseptic procedures; antisepsis is gradually being supplanted by asepsis and disinfection is made unnecessary by avoiding infection.

5. That to secure ideal results in the treatment of compound fractures the injury of the bone must be treated upon the same general principles that are applied to secure union by the first intention of wounds in soft parts; that is, by carrying out in detail the rules of asepsis and antisepsis, immediate and perfect reduction, approximation with direct fixation, efficient external support, and immobilization.

SUPPURATIVE PERFORATIVE OSTEO-MYELITIS OF INFERIOR MAXILLA,

AND MULTIPLE SUPPURATIVE OSTEO-MYELITIS OF TIBIAL SHAFT, IN ANOTHER PATIENT.

BY THOMAS H. MANLEY, M.D.,

SURGICAL CLINIC AT HARLEM HOSPITAL, NEW YORK.

Dr. Manley stated that he had been specially fortunate, in being able at the same clinic to exhibit two very interesting cases of an identical pathological process, in two different subjects, who, in each, presented, however, very widely diverse conditions, as to age, general condition and the seat of lesion.

The first case was a young woman, born of healthy parents, in Germany 27 years ago. She was cigar-maker by occupation and always enjoyed good health until two years ago. He said you will notice that she is of slight build, fair complexion, bright eyes, but of anæmic appearance.

Two years ago she had the left lower bicuspid and first molar tooth extracted. Since then she has had constant trouble with the left lower jaw. At first there were neuralgic pains, then swelling and tenderness along the ramus of the left lower jaw; and finally, something about fourteen months ago, an abscess formed and burst, just a little posterior to the anterior surface attachment of the masseter muscle into the same jaw-bone, in other words, about three lines posterior, to the point at which the facial artery winds over the free border of the jaw. She has been under various practitioners' care, trying, in turn, antiseptic solutions, iodoform ointment, poultices, and caustics; but in no instance with any substantial benefit. It had been dried up or healed, in this time, twice; but each time with the closure of the drain her sufferings were aggravated, until it reopened.

Along with the disfiguring effect of the opening, she has to continually wear some sort of absorbable material to soak up the drip, which intermittently escapes from it. Now, the question arises what is the nature of this lesion and where is the precise source of this discharge?

She denies specific disease, and it surely is not malignant; this case, then, is one which in modern times is known as tubercular. But how did she acquire tuberculosis? She did not inherit it, nor has she been subjected to contagion. The fact of it is, she has what our fathers in medicine would have designated a strumous-diathesis. At the time of the extraction of these teeth the alveolar arch was damaged by misdirected forceps pressure, or else the dentist has left the necrosed fang of a tooth imbedded in the jaw. This has acted as a splinter or foreign body, so that we have a condition present, dependent on two distinct conditions. First, a constitution-cachexia, plus a traumatism. The precise source of this sinus which opens through the soft parts, is in the osseous elements of the jaw.

The prognosis, in tubercular disease in bone is said to be unpromising in adults. This is correct, when the process extends into, and involves the joints; but it certainly is not when the lesion is limited to the shaft or diaphysis, as in this case: for though I have treated a considerable number of this description, I have yet to see one which did not promptly and permanently recover. The operative technique, in this case, will consist of the application of a few simple principles of surgury. First, go into the mouth and make a deep furrow, with the scaipel down on to the alveolar surface of the bone, at the suspected point. If we come on a fang, and I think I can feel one, freely strip and extract it. Next, make a free opening over the small sinuous fistula and trace it to the point of disease in the bone. Scrape away all the softened carious bone, trim away the cicatricial, calloused edges of the ulcer and firmly seal in the cut with fine silk. We will do the draining through the mouth. The patient being ready, the first step in the operation was to enter the buccal cavity and extract the long angular necrosed root of a tooth. Now, the operator seized a small pointed gouge and scraped the cavity from which the dental substance had been removed. He said that here the bone was so rotten and friable that he could push his little finger entirely through the bone shaft into the opening in the skin. A direct communication was now made, the cavity of the mouth being continuous with the external opening. After grattage

and irrigation the external wound was pared and carefully sutured, when the usual aseptic dressings were applied.

The second patient, was a boy ten years old with the following history: Six months previously he had scarlet fever, after which he suffered from nephritis, and rheumatic pains in the lower limbs. About three months ago, two suppurative points broke out on the inner surface of the left leg, from which a sero-purulent matter has since issued. After awhile along the same plane, and on the same surface, many other purulent foci erupted, and now as can be seen, one side of the limb, from the knee downward, is covered with port-holes which communicate with necrosed bone. Twice the pus has made its way to the surface. All severe pain in the limb has ceased.

What is the pathological character of the process which has led to such extensive bone disease? Is the lesion tubercular? In answer to this one might ask, is the specific germ present? We may say, that it has not been proved. In fact, I attach no importance whatever, to the presence or absence of this germ, for it is incontestibly true that we may, and do have strumous disease, so-called tuberculosis without the bacillus. And, again we often find myriads of them, in the laudable pus of a healthy strumous wound. The fact is, that the basis of this boy's disease is blood change. The poison of scarlet fever is terribly destructive to the blood, and the vaso-motor nerves. In this case, the deeper layers of bone, lining the medullary canal have simply perished, through mal-nutrition. It may be noted that although there is extensive disease of this boy's leg, yet he walks without a limp. This is commonly found in all cases, where the bone lesion is at a considerable distance from an articulation.

On an examination of the limb, I find a probe will enter any one of those apertures and penetrate deeply into the medullary cavity. Small, loose particles of sequestra can be felt at the top of the probe. Now, I will by surgical interference endeavor, at least, to do to this boy no harm; that is, I will simply enlarge those openings and endeavor to pick out with the dressing forceps, the fragments of remaining dead bone, which the natural processes of life are, unaided, rapidly disintegrating and throwing off, by liquifaction. It might be said that as I have not very extensively opened the cavity of this bone some microscopical foci of the disease may have remained. But, in my experience the generalization of tubercle is never dependent on a local lesion; hence, I am confident that in operating in these cases, it is better to err on the side of conservatism, than to take chances on an extensive mutilation and consequent damage to structures, which might have been preserved, if nothing whatever had been done, other than by a tentative therapy.

PRACTICE OF MEDICINE IN ANCIENT ROME.

BY J. F. JENKINS, M.D.,
OF TECUMSEH, MICH.

In an early day, the practice of medicine in Rome was chiefly confined to foreigners, principally Greeks. Most of the physicians whose names are handed down to us are of Greek origin, yet there were many Egyptians and Syrians, who practiced medicine in Rome as well as in the provincial cities.

If we go still further back in the history of Rome, we find wealthy families who kept many slaves, and would have one of their number skilled in the medical art, who would gratuitously practice for the household but received compensation from those outside of the household.

During the reign of the Cæsar's, and the century following many physicians in Rome became very popular; some of them received large fees which would compare very favorably with the fees of the popular physicians of the present day.

Pliny the Elder states that an ex-praetor, who had leprosy paid a physician 20,000 sesterces, about $8,000, but he does not state how long he attended him, whether it was for one visit or for several of them. The same author states that there were five physicians in his day whose annual income amounted to 250,000 sesterces, equal to $10,000 per annum. The physician to the emperor Claudius, Stertinius by name, received 500,000 sesterces, or $20,000 per annum, still he claimed he could make in private practice 600,000 sesterces or $24,000 yearly. The amount which this physician received from Claudius is probably equal if not greater than the salary of any modern court physician.

Stertinius and his brother who was also a physician, left a fortune of thirty millions of sesterces, or one million two hundred thousand dollars, besides making large donations during their lifetime to the city of Naples. Pliny mentions another physician, named Cranus of Marsailles, who gave largely, and spent money very freely, yet, notwithstanding his extravagant life, left a fortune of ten million sesterces, a sum equal to four hundred thousand dollars.

In the Roman empire, there was no law regulating the practice of medicine consequently many, as in our day commenced the practice of medicine with little or no preparatory education; many left trades and other occupations, and with a large supply of effrontry commenced the practice of the healing art. Like their modern type, some succeeded while others failed.

During the first century of the Christian era, there had developed all sorts of specialists; there were surgeons, gynecologists, oculists, aurists, dentists, etc., in all probability as great a variety as the nineteenth century has developed—in this way we find history repeating itself. Different schools of medicine existed, among which may be mentioned the "wine-givers" who no doubt were very popular in their day; the cold water doctors, one of whom named Antonius Musa gained the reputation of saving the life of the first Roman emperor, Augustus, although it is said that he killed Marcellus.

Pliny makes a statement that we very often hear at the present day, that physicians frequently try experiments upon their patients, and that the doctor is the only man in the community who may kill people without punishment.

Doubtless medical knowledge had made some progress since the days when Hippocrates taught the healing art under that famous old tree in the Isle of Cos, but our means of knowing how much progress was made is very limited, yet when I looked over the house of the surgeon in Pompeii, and examined the instruments that were taken out of this house, (which are in the museum at Naples), I am led to believe that the educated physician and surgeon of that day was in every way equal to the civilized society of the first century.

EYE TROUBLES WHICH CONSTITUTE A FREQUENT SOURCE OF HEADACHE, VERTIGO AND NAUSEA, AND OTHER NERVOUS DISORDERS.

Series of four lectures delivered at the Fourth Special Course of the Chicago Policlinic.

BY F. C. HOTZ, M.D.,
PROFESSOR OF OPHTHALMOLOGY.

LECTURE IV.—SUPRA-ORBITAL NEURALGIA AND GLAUCOMA.

Fourth group.—While in all the affections of the three preceding groups the eye-ball showed no sign of disease, but exhibited an absolutely normal appearance, it is always decidedly changed in the fourth and last group of ocular affections we have to deal with. And while in the three other groups your failure to connect the headaches and other nervous symptoms with the ocular affections would have no serious consequence, it may result in the loss of the eyesight, if you fail to recognize at once the disease of the fourth group as the cause of the violent migraine with nausea and vomiting your patient wants you to relieve him of.

Gentlemen, I am referring to the fact that the severe neuralgic pain and the violent gastric disturbances, induced by acute glaucoma, have been taken and treated for "rheumatic or malarial" neuralgia while the ocular disease has not been recognized until it was too late. I have seen several instances of this mistake; one was an especially sad case which impressed me so much that I shall never be able to efface its picture from my memory. Though fifteen years have gone by since I have seen the unfortunate patient her image is before me now as vivid and distinct as if I had seen her but yesterday. Two months before I saw her, she had been seized with fever, nausea, frequent vomiting and violent pain extending over the entire left side of the head. Her physician pronounced her trouble to be gastritis and "sick headache," and when the old lady called his attention to the fact that her sight was getting poorer every day (and she could see with the left eye only; for the sight of the right eye had been destroyed by glaucoma ten years previously) he assured her she need not worry about it; that her sight would return as soon as the stomach trouble was cured and the neuralgia in the head relieved. Having implicit confidence in her physician she believed his word and though her sight soon had vanished completely she waited hopefully for the day when the darkness would be lifted again from her eye, and patiently endured the constant, most violent headache which robbed her of rest and sleep by day and night. For two weary months this poor woman suffered and hoped; but then her patience was exhausted and much against the will of her physician she went to consult an oculist. Poor woman! It was too late. The continued high tension of glaucoma had done its deadly work upon the optic nerve too thoroughly; and although the iridectomy effectually reduced the intra-ocular tension and promptly relieved the patient of the terrible headache so that after the operation she could enjoy a good quiet sleep —for the first time in eight weeks—the woman has never seen a ray of light again—the awful result of a mistake in diagnosis!

But such mistakes should not occur; they are inexcusable; for they can easily be avoided. It is a very fortunate coincidence that to-day there is in our clinic a case of supra-orbital neuralgia and a case of glaucoma because they afford a good opportunity of pointing out to you the several features by which the simple neuralgia may be distinguished from the glaucomatous neuralgia.

This young man has for the last three days suffered with severe pain over the right side of his head; the pain began every morning about eight o'clock, starting over the right eye and extending upwards and backwards, but never over to the left side of the head. It increased in intensity till about 10 o'clock, continued for several hours and then gradually subsided. By three o'clock P.M., the paroxysm was over to begin again at eight o'clock the next morning. At the present time the attack is pretty well on; you can tell by the patient's countenance that he is suffering, and he will tell you so too. The supra-orbital notch is quite sensitive to the pressure of my finger; the eye is red, weeping and quite sensitive to light. But its vision is not impaired; the cornea is clear and bright, the pupil of normal size and readily responding to the influence of light. The fundus can well be illuminated by the ophthalmoscope and appears normal; the eye is not tender to the touch and shows a normal degree of tension. This then, is a true supra-orbital neuralgia, and the regular periodicity of its paroxysms would indicate its malarial character.

Now the attack of acute glaucoma also begins very suddenly with supra-orbital pain which spreads over the whole side of the head, and is also strictly limited to the one side. And if in addition it is ushered in by a chill, and accompanied by nausea and vomiting, as it often is, the similarity with "malarial" or "sick" headache is indeed very great; and like the sick headache, the glaucoma paroxysm may last only 12 or 24 hours, to return after several weeks or months. Usually, however, this terrible pain continues in unabated fury for several days, and this long duration and great violence should make any physician cautious not to regard the trouble a simple neuralgia until the most searching examination has failed to find a tangible cause and until he has especially satisfied himself that there is nothing wrong with the eye, even if the patient makes no complaint about his sight. For in the agonies of pain and with the sight of one eye perfect, the patient may not notice at all that the sight of the other eye has been rapidly failing since the beginning of the dreadful neuralgia, and that he may be scarcely able to distinguish light.

During the paroxysm of acute glaucoma the eye always shows great and characteristic changes; the upper lid is swollen; the palpebral conjunctiva œdematous, the sclera covered with engorged dark red veins; the cornea looks dull and smoky; the pupil is dilated and does not respond to the influence of light, and often shows a muddy, greenish color. The iris appears pushed forward toward the cornea, so that the depth of the anterior chamber is more or less reduced. The interior of the eyeball cannot be inspected by the ophthalmoscope because of the cloudy condition of cornea, aqueous humor and vitreous body, and most important symptom of all! the eyeball shows a very high tension; that is to say, when you place your finger gently upon the upper lid and slightly press down on the eye, you feel a much stronger resistance than

the normal eyeball offers. The intra-ocular tension has rendered the globe so hard that you imagine you are touching a solid marble, and not an eyeball.

The typical attack of glaucoma is usually preceded by slight disturbances, which, however, many patients pay little attention to and consider of no consequence. But a careful observer remembers that long before the glaucoma attack, he had noticed on some days his sight grew dim for several hours, and at the same time he felt a dull pain in the forehead and a fullness in the eye, and if he happened to look at a gas or lamp light, he saw a rainbow colored halo around the light. At first these premonitory signs of the approaching storm last but an hour or two, and reappear at long intervals, or perhaps on special occasions, (after great mental excitement, bodily exertion, too great indulgence in the pleasures of the table, etc.), but sooner or later they return at shorter intervals and remain longer, until finally the full attack breaks forth.

The duration of the glaucomatous attack has no limit; it may last but one day, or it may only abate in fury, but never let up entirely until the sight is thoroughly extinguished. When the attack subsides quickly, the sight soon returns, and the patient congratulates himself upon the happy result. But sooner or later he will have another attack which may not be so severe as the first one, but after which the sight does not return any more as completely as before. And after another pause there comes a third, and a fourth attack and so on, each one leaving the sight in a more impaired condition, until finally the last glimmer of perception is wiped out.

Or after the first outbreak of glaucoma the patient is never troubled with severe neuralgic pain; but the intra-ocular tension remains permanently increased, slowly but surely doing its destructive work upon the optic nerve fibres, achieving their complete atrophy and producing that peculiar excavation of the disc so characteristic of chronic glaucoma.

We distinguish three kinds of excavations of the optic disc; the physiological, atrophic, and glaucomatous one.

The *physiological excavation* is a funnel-like depression in the center of the disc; it varies greatly in extent but—and this is the very important feature—it never occupies the entire area of the disc; there is always a ring of nerve substance between the edge of the disc and the margin of the physiological excavation.

The *atrophic excavation* caused by tissue waste in the optic nerve, is a shallow depression extending over the whole disc, its surface gradually sloping down from the edge to the center.

The *glaucomatous excavation* also occupies the entire area of the disc, but it is steep, cup-shaped and much deeper than the atrophic excavation because the lamina cribrosa (which constitutes the bottom of the excavation) has been pushed backward by the continued high pressure upon it. This great and steep depth of the glaucomatous excavation produces a peculiar and very characteristic ophthalmoscopic picture; the floor of the sunken-in disc presents the pale, whitish, mottled appearance of the lamina cribrosa; the central retinal artery and vein do not appear to emerge from the center, but near the nasal border of the disc, and when the vessels reach the periphery of the disc they make a sudden sharpe curve upwards to ascend the side of the excavation in order to get over the edge and into the plane of the retina. Where the excavation is very deep and the sides very steep, the bent of the blood vessels may be so sharp that the ascending piece is hidden from our view, and the vessels crossing the disc seem to have no direct connection with the vessels we see proceed from the edge of the disc. And when we move our head slightly while inspecting the glaucomatous disc we observe a distinct parallactic displacement, the vessels on the disc appearing to move in the same direction with our head, while the vessels at the edge of the disc appear to move in the opposite direction. Moreover, we cannot see the bottom and the edge of the excavation distinctly at the same time; if we see the bottom plainly, the edge is indistinct, and if we adjust our sight for the edge, the details of the bottom become faded and hazy, because they are situated beyond the plane for which our sight is adjusted.

Whichever course glaucoma may pursue, absolute blindness is the inevitable final result, unless the disease is arrested by surgical interference. No medical treatment (local or general) can permanently stop the progress of glaucoma; but a properly executed iridectomy performed at the early stage, will stay the progress of the disease and save the sight. It was in 1856 when Dr. Graefe made known his great discovery, one of the grandest triumphs of modern surgery; and thousands upon thousands of men who would have been doomed to blindness for the rest of their lives, owe the preservation of their sight to the genius of Graefe.

The success of the iridectomy depends largely on the duration of the malady; in acute glaucoma especially it should be performed at the earliest moment; and you will, therefore, now realize that it is every physician's sacred duty to study the symptoms of glaucoma that he may recognize its presence and look for it as the possible cause of violent persistent sick headache, especially if this occurs in a patient beyond the age of 40; for glaucoma is a disease of advanced age, most frequent between the years of 50 and 70, and seldom found in a person under 40.

Gentlemen, I am just being reminded that the hour has expired. Let me then thank you for the close attention you have paid to my lectures. I have not dwelt upon the details of the treatment of these various eye troubles, because it would have been impossible to crowd so large a subject in the small compass of four lectures; and because I do not regard it the duty of the general practitioner to treat these ocular affections. His duty it is to know that they are often the cause of nervous disturbances; his duty it is to understand the symptoms of these ocular affections so that he is able to recognize their presence and to urge upon his patients the necessity of having his eyes attended to. His duty it is to look for these eye affections in all nervous troubles for which he cannot find any other satisfactory cause.

The task I had set before me in these lectures, was to make you acquainted with the principal types of these ocular affections; to explain how they affect the nervous system and to impress upon you the importance and necessity of their treatment.

Let me hope that I have succeeded in my endeavors. Let me hope these lectures will help you to solve many perplexing problems in your practice, and to bring relief where you vainly had exhausted

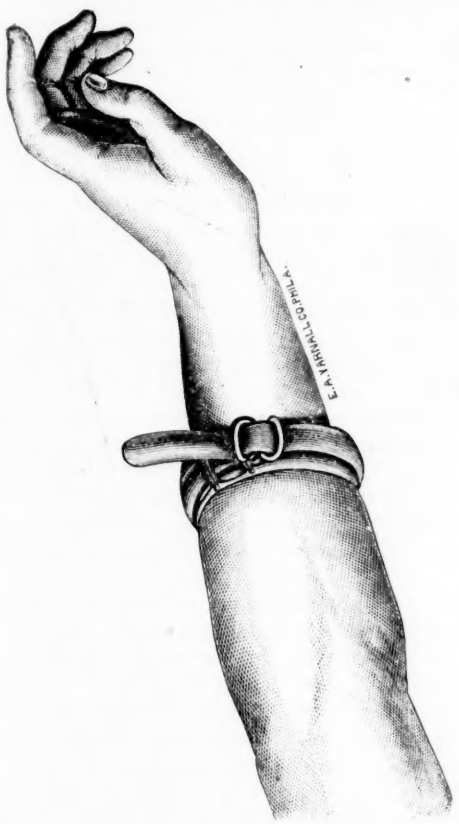
your medical skill before. And if then you feel that these hours in the Chicago Policlinic were well spent for the knowledge you received, let me hope you will also kindly remember him who has given you this information.

A SIMPLE TOURNIQUET CLASP.

Read before the Philadelphia Academy of Surgery, January 9, 1893.

BY H. AUGUSTUS WILSON M.D.,
CLINICAL PROFESSOR OF ORTHOPEDIC SURGERY, AT THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

It must be evident to every one who has occasion to use the elastic turniquet and Esmarch's bandage, that the simplest form of all methods of fastening it, when applied, is either not known, not efficacious, or possesses other disadvantages. The method referred to, is to pass the loop of rubber bandage underneath one of the last turns as it is applied, which by contraction holds the end in place. The rubber tourniquet, as sold by the shops in this country, is always provided with a chain, of about six or eight inches in length, for the purpose of holding the end of the bandage and keeping it from slipping. The use of this chain necessitates the application of the entire length of the bandage whether it is required or not. It was in order to dispense with this chain that I advised the simple form of clasp that is shown in the accompanying illustration. Messrs. E. A. Yarnall & Co., surgical instrument makers, in this city, have made the clasp, following my directions. It consists of a simple letter S made out of one-eighth inch German silver wire, and is so simple in its construction that any one can twist a piece of wire into the necessary shape, as I did with the original design. The manner of using the clasp is so clearly shown in the cut that a description is not at all nescessary. Its advantages are, simplicity of construction and use; that the tourniquet may be clasped at any point; that while in use it cannot slip, and that the tourniquet may be unclasped with the greatest ease. It would appear that there was some necessity for a form of clasp of this nature, in view of the extensive advertisements in English medical journals of a *patented* appliance of very much more elaborate construction and therefore quite expensive. Continued trials of this simple clasp, when used with ordinary elastic rubber tubing, have shown that it was all that was required for the purpose, and it is hereby given to the profession, with the hope that it may tend to displace more cumbersome and unsatisfactory methods of accomplishing the same end.



PNEUMONIC FEVER—ITS SYMPTOMOLOGY.

BY EDWARD F. WELLS, M.D.,
OF CHICAGO.

FEVER.

Very early in the attack, during the chill if it is present, other important symptoms arise. Thus in almost every case the body heat is elevated above the normal and so remains until the advent of convalescence, when for a few days, it often falls below the standard of health, after which it regains its proper equilibrium.

The curve of elevated temperature usually ascends abruptly during the first few hours, and in some cases speedily reaches a great height,[1] as shown in the following table:

TABLE I.—SHOWING RISE OF TEMPERATURE EARLY IN THE ATTACK.—UNSELECTED CASES.

Age.	Hours After Access.	Temp.	Age.	Hours After Access.	Temp.
60	2	96.0	8	11	102.0
77	15	97.0	5	8	102.0
23	5	99.0	55	4	102.0
47	2	99.2	7	9	102.1
72	12	99.6	48	6	102.1
30	12	99.7	41	9	102.1
19	1	99.8	24	15	102.2
59	7	99.9	13	4	102.2
30	5	100.0	20	6	102.4
35	11	100.0	20	1	102.5
7	5	100.0	19	10	102.6
81	7	101.0	48	7	102.7
30	15	101.0	18	6	103.0
12	10	101.0	4	6	103.7
45	4	101.2	4	3	103.8
6	10	101.3	29	11	103.9
8	8	101.4	71	14	103.9
7	1	101.4	46	8	103.9
35	10	101.5	18	6	104.0
36	11	101.5	5	9	104.0
5	11	101.5	17	3	104.1
28	7	101.6	19	1	104.2
36	6	101.7	2	10	104.7
27	10	101.8	47	8	104.8
3	10	102.0	23	3	104.9
54	14	102.0	24	9	105.0
40	6	102.0	76	3	105.0
46	7	102.0	20	8	105.2
49	6	102.0	88	5	105.5
18	4	102.0	19	14	105.6

Baginsky[2] observed a temperature of 104.2° in a child two hours after the initial chill. Fox[3] has known of a case in which the thermometer marked a temperature of 105° within a few hours after the first sensations of illness. In a

[1] The remarkable rapidity with which the fever is developed was recognized by Alexander, of Tralles. See Opera Omnia, Lib. v. cap. I, so early as the sixth century.

See also Grimshaw, Dublin Jour. Med. Sci., May, 1869;—Kocher, Croupous Pneumonia, Würzb., 1866, S. 38;—Lebert, Berliner klin. Wochenschr., Sept. 4, 1871;—Smith, Phil. Med. News, Jan. 5, 1889, p. 24;—Ott, N. Y. Med. Jour., July 13, 1889, p. 29;—Louis, On Phthisis, Boston, 1836, p. 190;—Pepper, Med. News, July 5, 1890.

[2] Pneumonie u. Pleuritis, Tübingen, 1880, S. 34.

[3] Reynold's Syst. Med., Phila., 1880, vol. ii, p. 176.

series of five cases given by Juergensen[4] temperatures of 104°, 104.7°, 105 8°, 104.4°, and 104.4 was observed 2¾, 4, 4, 7 and 8 hours respectively, after the access of the disease. Monthius[5], in one case found the temperature, during the chill 100.9°; fifteen minutes later 102.7°, and at the end of an hour 105.8°. In one of Pepper's cases the temperature reached 105° within an hour of the initial chill.[6] Scheef[7] saw temperatures of 104°, 104.6°, 103.8°, 104.6° and 105.6° at 4, 3, 1 and 6 hours, respectively. after the onset of the symptoms. Thomas[8] in two adults marked temperatures of 104.9° and 105°, nine and twenty-three hours respectively, after the beginning of the attack. Ziemssen[9], observed a temperature of 102.5°, in a child four hours after the beginning of the attack; and temperatures of 103.5° and 104°, respectively, in two children twelve hours after the initial symptoms.[9]

Ever since the comparatively recent reintroduction of the thermometer into practical medicine[11] it has been the desire of physicians to make it a certain guide, a veritable mariner's compass in the diagnosis, prognosis and treatment of diseases,[12] and charts have been constructed showing what their authors are pleased to term the "normal temperature curve" of various maladies. Pneumonic fever has not escaped attempts at being made to fit one of these charts. My observations have convinced me that such generalizations have usually been deduced from insufficient and unreliable data, and that the deviations from the average are so numerous and wide as to render such charts misleading. Let us here pause to hear what a few of the systematic writers have to say on this subject:—

Aitkin,[13] states that the diagnosis may be established by the range of temperature alone, and that a patient exhibiting the general typical symptoms of pneumonic fever, but with a temperature not ranging above 101.7° may be safely considered as having his lungs free from inflammatory exudate.

Flint[14] says that "the thermometer in the axilla indicates more or less increase of heat, the increase, in mild cases, not exceeding 104°."

Fox[16] says "one of the most marked features of pneumonia, which is almost sufficient to distinguish it from other diseases, is the sudden and considerable rise of temperature which marks its invasion and which, with some exceptions, is then maintained, with slight morning remissions and evening exacerbations throughout its course until crisis occurs. The rise of temperature during the rigor is common to most diseases but its subsequent maintainance at a very high standard during the succeeding first hours and days is limited to a small class of inflammatory affections."

Green[16] says that the thermometer will range from 102° to 105°, being lowest at about 8 A.M.. and highest in the early evening.

Holt[17] says that "the temperature fluctuates slightly during the day, being 102° to 103° in the morning and 104° in the evening, until the sixth or seventh day, sometimes not until the tenth, when it suddenly falls to or near the normal."

Juergensen[18] says that the temperature speedily rises to 102° or 103° and remains so, with morning remissions, and evening exacerbations of from 1.8° 2.7°, to rapidly sink to the normal at the termination of the fever.

Schuyler[19] says that the temperature rises suddenly to the maximum shortly after the onset of the malady, is maintained at a high level during the course and rapidly falls to a degree or more below the normal at defervescence.

Sturges[20] repudiates ready-made charts, but says that there is high temperature at the beginning and to the end of the first week, with but slight morning remissions and liable to sudden elevations. He says, with much truth that this, nor any other isolated symptom can be trusted as a measure of the gravity of the disease,[21] as a temperature of even 107° may be met with in successful cases.[22]

Trousseau[23] says that the temperature quickly rises after the chill to 102° and continues at this point, with slight oscillations, until the crisis, when it falls rapidly to, or below the normal.

Waters[24] says that the temperature rarely rises above 106°. In a series of 106 cases the temperature only once reached 106°, and in only a small proportion did it pass beyond 105°. The general course is a very definite one—a high temperature is maintained for some time, a so-called crisis comes and there is rapid defervescence.

Wunderlich[25] would call all cases severe in which the temperature ascends beyond 104°.

Ziemessen,[26] speaking of the disease in children, says that the temperature ascends rapidly and remains at its acme, about 104°, until the crisis, when it falls to or below the normal, remaining so for several days. The highest and lowest temperatures met with by him were 106.7° and 97.1° respectively.

It will be seen from the above selections that writers generally have believed that in this disease the temperature runs a very definite course. This, however, is by no means the rule; neither can the conscientious observer make one case in ten fit the ready made charts as prepared by some systematic writers. I have the records of the temperature of several hundred cases of this disease, collected from the published writings of others, in addition to my own 498 cases, and a study of these show in a graphic manner the shifting sands forming the foundations upon which, after too hasty generalization, has been erected the superstructure of thermometry in pneumonic fever. Take the temperature of any large number of cases and represent them graphically in charts and any unprejudiced observer must acknowledge that he has before him a trackless wilderness of unmeaning lines.[27]

In view of these facts we can say that, in general, the corporeal heat is elevated from two to five degrees, Fahr., above the normal, continues so for about six days, and falls rapidly to or below the standard of health. That in a few cases the temperature attains a great height and in yet a few others it is but little or not at all exalted and may even be subnormal throughout the attack. Finally that there are so many exceptions to these rules that it were well to ignore them altogether.

The temperature, corresponding with the normal diurnal variations, is usually higher in the evening than in the morning.[28]

As a general rule the severity and dangerous tendencies of the case may be measured, in part, by the height of the temperature, and, by common consent, the 104th

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4 Ziemssen's Handb., Bd. v. S. 71.
5 Ihèse de Paris, 1868.
6 Med. News, July 5 1790.
7 Inaug. Dissert., Tübingen, 1882, S. 33.
8 Arch. d. Heilk., Bd. v. 1864, S. 31.
9 Pleuritis u. Pneumonie, Berlin, 1862, S. 202.
10 See also Zimmermann, Präger Vierteljahrschr., 1852, Bd. xxxv, S, 197, and many others.
11 Chiefly through the efforts of Compton, Dublin Jour. Med. Sci., vol. lii:—Grimshaw, Idid, 1866;—Bärensprung, Müller's Archiv., 1851-2;—Maclagan, Edinb. Med. Jour, 1869;—Parker, Med. Times and Gaz., 1886;—Thomas, Arch. d. Heilk., 1864-65;—Traube, Ann. d. Charité, Bd. 1;—Waters, St. Bartholmew's Hospt. Rpts., vol. ii;—Wunderlich, Das Verhaltniss d. Eigewärme in Krankheiten: Arch. & Phys. Heilk., Bd. xv. S. 19;—Ziemessen, Op. cit.;—Zimmermann, Präger Vierteljahrschr., 1852, and others.
12 It appears that Sanctorius first had the idea of measuring the temperature of the body in disease by the thermometer at the end of the sixteenth, or early in the seventeenth century. Baümler, Quain's Dic. Med. N.Y., 1883, p. 1615;—Cleghorn, Epidem. Dis. Minorica, London, 1762;—was the first, so far as my information extends, to make use of this instrument in investigating pneumonic fever, in 1745. Donné, Arch. Gén. de Méd., 1837, and Roger, Ibid. T. vi., made observations upon the temperature in this disease previous to 1840.
13 Science and Practice of Medicine, 2nd ed., London, vol. i, p. 50.
14 Prac. Med. Phila. 1868, p. 177.
15 Reynold's Syst. Med., Phila., 1880, vol. ii, p. 176.
16 Quain's Dic. Med., N. Y., 1883, p. 877.
17 N. Y. Med. Rec., Feb. 14, 1885, p. 174.
18 Ziemessen's Handb., Bd. v. 1877, S. 70.
19 N. Y. Med. Jour., Aug. 25, 1883, p. 206.
20 Nat. Hist. Pneumonia, London, 1876, p. 251,
21 See p. 42.
22 See p. 41.
23 Clin. Med., Phila., 1873, vol. i, p. 664.
24 Brit. Med. Jour., Dec. 20, 1879, p. 978.
25 Op. cit.
26 Op. cit., S. 202, u. 211.
27 See also Wells, Cin. Lan. and Clin., June 10, 1882.
28 See also Bärensprung, Müller's Archiv., 1851, S. 160, u. 1852, S. 251;—Cleghorn, Epidem. Dis. Minorica, London, 1762, and others.

degree is considered the dividing line between the mild and moderately severe cases and those which are very severe and dangerous.[29] In my own practice I have met with several cases with a temperature of more than 104°, yet recovery ensued in the majority, and in some of these no alarming symptoms whatever were noticed. In many of the fatal cases the thermometer at no time indicated a very exalted corporeal heat, and in some instances death was preceded by a subnormal temperature. Generally, however, death was anticipated by a great elevation of the temperature. The highest temperature recorded in my case-book is 108°, noticed in an aged lady an hour before death.[30] The lowest axillary temperature met with was 94°, in several cases—fatal and non-fatal. A gradual and persistent rise of temperature after the fourth day has generally portended a very grave or fatal case. In my cases the average temperature at the height of the disease has been much lower than I was led to expect from the statements of the text-books.

In children the temperature usually ranges higher than in adults; attaining, in most cases, a height of from 102° to 105°. The rise at the beginning and the fall at the close of the attack are usually remarkably abrupt. In senile cases the temperature curve is somewhat lower than in adults, although some of the highest markings I have made were in such patients. In males the temperature is said[31] to be slightly above that of females, but this is not proven by my records. Juergensen[32] says that in the case of females about menstruating, the temperature is apt to be quite high until the flow is established, after which it usually declines very considerably. This statement is in accord with my own observations. Many writers affirm that the portion of lung affected exerts a considerable influence over the temperature curve, it being higher when the localization is in the upper lobes than when the lower parts are involved, but my experience does not confirm this opinion.

Shortly before death the temperature often rises to a great height[33]—108.9°,[34] 109.4°,[35] 110.6°,[36]—and continues to rise to a slight extent post mortem.[37]

As convalescence approaches the temperature often pursues a peculiar course. Instead of there being a morning remission, the temperature will probably remain high, with considerable perturbation of the general system. In the evening, however, the body-heat begins to fall rapidly until it reaches the normal, or a sub-normal point, in the course of a few hours. In some cases the fall of temperature is very gradual and prolonged,[38] occasionally one to three weeks being occupied in the defervescence. The physical signs disappearing equally slowly.

When defervescence is very rapid[39] the temperature commonly descends to below the normal. This occurred in more than 60 per cent. of my cases. It usually begins to fall during the first week, and this is generally coincident with improvement of other important symptoms and the beginning of convalescence.

Of my cases the fall of temperature began before the third day in 5 per cent,[40] during the third day 10 per cent., during the fourth day 15 per cent., during the fifth day in 20 per cent.; during the sixth day in 20 per cent.; during the seventh day in 10 per cent.; during the eighth day in 10 per cent.; during the ninth day in in 5 per cent. and after the ninth day in 5 per cent.[41] It usually began in the evening after a most promising morning.

A sudden fall of the temperature without any amelioration of the general symptoms is often[42]—but not always—of evil import.[43]

It has long been an interesting question as to what were the limits of corporeal temperature above and below the physiological zero endurable by the human body without causing death. That a rise or fall of a few degrees is injurious to the system has been almost universally accepted, and probably upon insufficient grounds.

The death lines of Uhle,[44] 106.1°; Goodhart,[45] 107°; Fiedler[46] and Wünderlich,[47] 107.6°; Liebermeister,[48] 108°; Richet, 109.4°; Baümler,[49] 110°; Anderson,[50] and Barnard,[51] 111.2°; Dalton,[52] 113°, and others have been so often transcended with impunity that these arbitrary limits are by no means so significant as their respective authors would have us believe. To show to what extent "hyperpyrexia" has been recovered from I have constructed Table II.

In the face of the above facts is it not putting the point to great tension to say that a high temperature is, *per se*, a cause of death? And if death does come in the wake of an exceptionally elevated corporeal heat, as is no doubt very frequently the case, does it always and necessarily follow that the event is directly due to the hyperpyrexia? May there not be other factors involved upon which depend both the excessive temperature and the fatal issue?

Sturges,[53] speaking of this says, and I think truly, that "it happens in fatal cases of pneumonia with exceptionally high temperature, that death reveals a condition of the lung absolutely irrecoverable; the high temperature is but the index of a condition which must under any circumstances have ended in death. For myself, I do not know of any case of pneumonia dying with such exceptional temperature that could be said to die of it, that from the state of the lung must not have died anyhow."

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[29] See also Fenwick, Lancet, 1891, vol. 1, p. 248;—Lépine, Pneumonie, Wien, 1883. S. 164;—Welch, N. Y. Med. Rec., April 15, 1888, p. 403;—Wunderlich, Op. cit., and others.

[30] The highest temperature observed by Benson,—Cin. Lan. and Clin., Sept. 21, 1889, p. 320,—was 107° shortly before death;—by Satterwaite, Phila. Med. News, Jan. 5, 1889, p. 5, 108°, at death;—by Katzenbach, N. Y. Med. Jour., June 6, 1891, 108.9° fifteen minutes before death, and by Wunderlich, —Inaug. Dissert., Tübingen, 1858, S. 27, 108.4°—two hours before death. One case is reported,—Med. and Surg. Rep., Oct. 3, 1886, p. 536,—in which the temperature reached 110.4° an hour before death.

[31] Hough, Phila. Med. Times, Nov. 8, 1873,

[32] Ziemessen's Handb., Bd. v. 1877, S. 72.

[33] In one of my cases 108° was reached.

[34] Fox, Op.cit., p. 177, also Loney, N. Y. Med. Record, June 16, 1888.

[35] Thomas, Arch. d. Heilk., 1865, S. 329.

[36] Doubleday, N. Y. Med. Record, March 28, 1885, p. 343.

[37] Lebert,—Berliner k. Wochenschr., Sept. 4, 1871,—says that in the majority of cases the range of temperature is favorable until asphyxia or collapse announce the end. This has very seldom occurred in my experience—in almost every fatal case remarkable thermometric changes were noticed for some time before death.

[38] Several such cases are in my collection, but the point is illustrated by the one reported by Fox,—Reynold's Syst. Med., vol. 11, p. 179. A boy, aged 15, of good general health, became chilled and had a rigor on the following morning, with the development of pneumonic fever, locally affecting the lower lobe of the right lung. Severe gastric catarrh was a complication. On the fourth day the temperature was 105°. On the eighth, ninth and tenth days it was 99°, 99° and 98.4° respectively. On the eleventh day it was 100°, and between this and the fourteenth day it ranged from 100° to 103°, after which there was a gradual decline to the normal on the thirty-fifth day. The physical signs continued to the sixtieth day.

[39] In one of my cases the temperature fell 10 degrees in forty-eight hours, and Ziemessen records a case in which the decline was 10° in sixty hours.

[40] In round numbers, approximately.

[41] Of Hermann's,—Lungenentzündung, 1880, S. 33,—43 cases the temperture began to fall on the first day in 2, on the second day in 8, on the third day in 11, on the fourth day in 11, on the fifth day in 5, on the sixth day in 1, on the seventh day in 3, on the tenth day in 1, and on the eleventh day in 1. In seven of these the fall began in the morning and in thirty-six in the evening. For further information see Samter, Inaug. Dissert., Breslau, 1881, S. 17;—Scheef, Inaug. Dissert., Tüb., 1882, S. 32;—Stortz, Inaug Dissert., Würzb., 1884, S. 57.

[42] See also Fothergill, St. Louis Med. Brief, May, 1886, p. 178.

[43] Nickles, Cincinnati Lan. and Clin., July 26, 1876, p. 39.

[44] Guy's Hospt. Reports, 1870.

[45] Deutche Arch. f. k. Med., Bd. I. S. 534.

[46] Thermometry, London, 1871, p. 99.

[47] Volkmann's k. Vorträge, Nr. 31, S. 240. Op. cit., p. 1600.

[48] Jour. des soc. sci., No. 207, 1888.

[49] London Lancet, 1887, vol. ii, p. 856.

[50] Kinsman, Ohio Med. Recorder, Jan. 1881, p. 350.

[51] Physiology, Philadelphia, 1875, p. 312.

[52] In some cases there is a subsequent rise of temperature, after it has fallen suddenly or gradually to the normal. See also Koettnitz, Inaug. Dissert., Halle, 1882, S. 77;—Samter, Inaug. Dissert., Breslau, 1881, S. 17.

[53] Pneumonia, London, 1876, p. 238.

TABLE II.—SHOWING RECOVERIES FROM HYPERPYREXIA.

Degrees Temp.	Disease.	Reference.
107 . .	Pneumonic fever . .	Fox, Reynold's Syst. Med., vol. ii, p. 177.
107 . .	" " . .	Bennett, N. A. Prac., vol. i, p. 206.
107 . .	" " . .	Kocher, Pneumonie, Würzb., 1866.
107 . .	" " . .	Pepper, N. Y. Med. Rec., June 11, '87, p. 666.
107 . .	Rheumatism	Bond, Lond. Lancet, 1887, vol. ii, p. 557.
107 . .	"	Barron, Lond. Lancet, 1890, vol. i, p. 1173.
107 . .	"	Fox, Hyperpyrexia, p. 10.
107 . .	"	Gull, Lond. Lancet, 1872, vol. ii, p. 562.
107 . .	" 8 cases .	London Lancet, N. Y., 1882, vol. ii, p. 148.
107 . .	Sunstroke, 2 cases . .	Ellis, N. Y. Med. Rec., Aug. 11, 1888, p. 148.
107 . .	Measles	Iliffe, London Lancet, Nov. 23, 1878.
107 . .	Sewer-gas poisoning.	Le Fevre, N.Y. Med. Jour., Dec. 14, '89, p.667.
107 . .	Laparotomy	Bantock, Jour. Am. Med. Ass., Dec. 3, 1887.
107 . .	After curettement .	Kelso, Lancet, March 7, 1891.
107.2 . .	Artificial	Krishaber, Gaz. méd. de Paris, 1877.
107.3 . .	Rheumatism	Sibson, Reynolds' Syst. Med., vol. ii, p. 517.
107.4 . .	Pneumonic fever . .	Jansen, Physician and Surgeon, Jan., 1884.
107.5 . .	Typhoid fever	Smythe, Cin. Lancet and Clinic, 1882, p. 293.
107.5 . .	Rheumatism	Bacon, Quoted by Sturgis, Op. cit., p. 251.
107.5 . .	"	Greene, Lancet, 1887, vol. ii, p. 254.
107.5 . .	"	Zinke, Jour. Am. Med. Ass., Nov. 13, 1886.
107.6 . .	Pneumonic fever . .	Juergensen, Op. cit., S. 72.
107.6 . .	" " . .	Lebert, Berliner k. Wochenschr., 1871.
107.8 . .	Rheumatism	Ringer, Med. Times & Gaz., '67, vol. ii, p. 380.
107.8 . .	"	Sibson, Op. cit., p. 518.
107.8 . .	"	Symes, Trans. Acad. Sci., Ireland, 1886.
108 . . .	" 4 cases .	London Lancet, N. Y., 1882, vol. ii, p. 148.
108 . . .	Sunstroke	Ellis, N. Y. Med. Rec., Aug. 11, 1888, p. 148.
108 . . .	"	O'Dwyer, Lond. Lancet, 1884, vol. ii, p. 144.
108 . . .	Hysteria	Smith, Quoted by Kinsman, Op. cit., p. 357.
108 . . .	Pneumonic fever . .	Sainsbury, Lond. Lancet, 1890, vol. i, p. 1174.
108 . . .	Ovaralgia	Donkin, London Lancet, Nov. 23, 1878.
108 . . .	Relapsing fever . . .	Fox, Brit. Med. Jour., March 30, 1872.
108 . . .	No diagnosis, 2 cases.	Donkin, Op. cit.
108.1 . .	Sunstroke	Mason, Boston Med. & Surg. Jour., Mar. 20, '79.
108.2 . .	Typhoid fever	Kartulis, London Lancet, April 26, 1879.
108.2 . .	Rheumatism	Andrew, St. Barth. Hosp. Rpts., vol. x, p. 338.
108.2 . .	"	Fox, Hyperpyrexia, p. 2.
108.2 . .	"	Weber, Trans. Clin. Soc., vol. v, p. 186.
108.5 . .	Puerperal condition .	Torrey, Boston Med. & Surg. Jour., Apr. 20, '76.
108.6 . .	Rheumatism	Dalton, London Lancet, 1887, vol. ii, p. 254.
108.6 . .	Sunstroke	Ellis, N. Y. Med. Rec., Aug. 11, 1888, p. 148.
108.6 . .	"	Ellis, N.Y. Med. Jour., Sept. 12, 1891, p. 288.
108.8 . .	Ovariotomy	Fenger, Jour. Gynecol., Sept., 1891, p. 394.
109 . . .	Sunstroke	O'Dwyer, Op. cit., p. 144.
109 . . .	" 2 cases . .	Cincinnati Lancet & Clinic, Oct. 5, '78, p. 252-3.
109 . . .	" 2 cases . .	Burrall, N. Y. Med. Rec., Nov. 24, '83, p. 568.
109 . . .	"	Ellis, N. Y. Med. Rec., Sept. 14, 1849, p. 287.
109 . . .	Delirium tremens (?)	Anstie, Brit. Med. Jour., March 30, 1872.
109.2 . .	Sunstroke	Mason, Op. cit., p. 407.
109.2 . .	"	Abbott, Boston Med. & Surg. Jour., July, '78.
109.4 . .	Hysteria	Wünderlich, Arch. d. Heilk., Bd., c.cx.
109.5 . .	Typhoid fever	Stewart, Brit. Med. Jour., March 30, 1872.
109.5 . .	Pneumonic fever . .	Carson, Cincinnati Clinic, April 26, '73, p. 195.
109.6 . .	Typhoid fever	Shattuck, Boston Med. & Surg. Jour., July 10, 1879, p. 61.
109.8 . .	Rheumatism	Carrington, N.Y. Med. Rec., Apr. 2, '87, p. 390.
110 . . .	"	Lancet, N. Y., 1882, vol. ii, p. 148.
110 . . .	" cerebral.	Da Costa, Am. Jour. Med. Sci., Jan., 1875.
110 . . .	Intermittent fever . .	Macintosh, Brit. Med. Jour., Dec. 20, '79, p. 978.
110 . . .	Sunstroke	Ellis, Op. cit., p. 148.
110.5 . .	"	Yale, N. Y. Med. Jour., Nov., 1874, p. 463.
111 . . .	"	Peabody, N. Y. Med. Rec., Feb. 27, '86, p. 254.
111 . . .	Ovaritis	Tait, Lancet, 1884, vol. ii, p. 59.
111 . . .	Ovariotomy	Tait, Ibid., p. 39.
111 . . .	Hysteria	Clemow, Lancet, 1887, vol. ii, p. 1112.
111 . . .	Spinal injury	Brodie, Brit. Med. Jour., Dec. 20, '79, p. 978.
111 . . .	Typhoid fever, 2 cases	Donkin, Lancet, March 15, 1879.
111.6 . .	" "	Donkin, Op. cit.
112 . . .	Scarletina	Church, Med. World, 1886, p. 212.
112 . . .	Synovitis	Donkin, Op. cit.
112 . . .	Painful stump	Donkin, Op. cit.
112.8 . .	Pneumonic fever . .	Lorentzen, Centralb., f. k. Med., Aug. 17, '89.
113 . . .	Sunstroke	Parkes, Chic. Med. Jour. & Ex., '78, vol. ii, p. 391
113 . . .	Pneumonic fever . .	Donkin, Op. cit.
113 . . .	Hæmoptysis	Lorentzen, Lond. Lancet, 1889, vol. ii, p. 805.
113.8 . .	Intermittent fever . .	Mackenzie, Brit. Med. Jour., Feb. 13, 1892.
115 . . .	No diagnosis, 2 cases.	Ormerod, Lancet, Nov. 9, 1878.
116 . . .	Hysteria	Ormerod, Ibid.
116 . . .	Abdominal pain . . .	Donkin, Op. cit.
116 . . .	Nephritis	Kinsman, Ohio Med. Recorder, 1881, p. 357.
117 . . .	"	Ormerod, Op. cit.
120.8 . .	Abdominal pain . . .	Mackenzie, Lond. Lancet, Nov. 5, 1881.
125 . . .	Spinal injury	Teale, London Lancet, March 6, 1875.
125.5 . .	Not stated	Little, Med. Times and Gaz., 1880.
128 . . .	Phthisis	Mahomed, Lond. Lan., N.Y., '82, vol. i, p. 35.
133.6 . .	Not stated	Little, Lond. Lan., N. Y., 1882, vol. i, p. 79.*

* No attempt has been made to make this table complete as to the published cases.

Other writers are also of the opinion that a high temperature is not in itself dangerous, and is not certainly prognostic of a fatal issue.[54] Thus Ziemssen[55] says, that "there is no doubt as to the dangers of hyperpyrexia, but it seems that the high temperature has usually not the significance which Liebermeister at first attributed to it. The severe cerebral symtoms, the cardiac degeneration, renal trouble, the trophic disturbances do not seem to be the effects of the high temperature, but effects of the dangerous process, the infection causing the fever." Welsh[56] says: "There is no doubt that temperatures of 110° to 113° produce serious symptoms, but whether or not ordinary temperatures of 105° to 107° exert any serious action on the body, is a question which is certainly unsettled. It has been shown that rabbits can be kept in a box, with a continuous rectal temperature of 107° for at least two weeks, provided the precaution is taken to keep the box well ventilated and the animals well supplied with moist food. Patients may have a perfectly clear brain and no grave symptoms with a temperature of 106° or 107°.

Opposite views are held by others.[57] Thus Lynch[58] says: "As I grow older and my experience enlarges I become more and more convinced that fever is the lethal agent which destroys life in almost every disease in which that functional derangement is present."

In this connection the question arises whether a high temperature may not be salutary, by destroying or preventing the multiplication of the germs of the disease.[59] This opinion has been advanced,[60] but with our present knowledge I cannot accept it.

Physicians generally have been so absorbed in recording temperatures above the normal that but little attention has been given to the markings of the thermometer below the physiological zero. It is no less true, however, that occasionally cases of various acûte diseases, and especially pneumonic fever, run their course with a temperature curve below that of health.[61] This fact is not usually mentioned, and, although not unknown, its importance is not always fully appreciated.

Doubleday,[62] in analyzing 254 cases of this disease, found that in three the temperature was sub-normal—in one as low as 92.4°. Fox[63] says: "Such cases must be extremely rare, and require data as to the day of the disease upon which they came under observation. The majority of cases in hospital practice are rarely admitted before the third day, and it must be remembered that even at this early period the temperature may in some cases fall from a pyrexial height to the normal standard. I have never seen a case of pneumonia unattended with pyrexia free from this suspicion." Schuyler[64] says "tnat the entire process of acute lobar pneumonia may occur without fever," and in another place[65] he records a case of this kind:—A German, aged 24, a grocer's clerk, whose duties led to early morning exposure whilst insufficiently clad, and who had not been strong for some weeks was, without chill, thirst or heat, attacked with pneumonic fever, characterized by prostration, anorexia, rusty sputa and scanty urine. When seen on the second day, the temperature was 97°, rising, three days later, to the normal, but at no time transcending the latter point.

I have met with several cases in my practice in which the temperature was normal or sub-normal.

A lady, aged 31, was suddenly attacked, at 1 P.M., Dec. 10, 1882, by a very severe lancinating pain in the region of the right nipple, followed in a few minutes by a profound chill and rigors. In due season all the ordinary signs and symptoms of pneumonic fever, locally affecting the lower lobe of the right lung, appeared. Convalescence was declared on the fourth day and a speedy recovery ensued. The highest temp-

[54] Loomis, N.Y. Med. Rec., Feb. 11, 1888;—Money, Ibid.,—July 10, 1886, p. 51;—Nothnagel, Wiener med. Wochenschr., Nr. 48. 1884;—Riegel, Centralb. f. k. Med., 1883, Nov. 10;—Schuyler, N. Y. Med. Jour., May 14, 1887, p. 542;—Smith, N.Y. Med. Rec., Feb. 27, 1886, p. 237;—Minot, N.Y. Med. Rec., June 11, 1887.

[55] Jour. Am. Med. Asso., May 14, 1887, p. 534.

[56] N. Y. Med. Jour., June 11, 1887, p. 666.

[57] Baginsky, Op. cit., S. 36;—Bettleheim, Lépine's Pneumonie, Wien. 1883, S. 58;—Juergensen, Op. cit.;—Ringer, Med. Times and Gaz., March 12, 1877;—Yale, N.Y. Med. Jour., Nov. 1874, p. 455;—Lebert, Berliner k. Wochenschr., Sept. 4, 1871—et al.

[58] Jour. Am. Med. Asso., June 18, 1887, p. 673.

[59] See Finkler, Therap. Gaz., Dec., 1886, p. 840.

[60] Fagge, Prin. and Prac. Med., Vol. i, p. 40.

[61] Anderson, Cin. Lan. and Clin., Oct. 2, 1880;—Brothier, Jour. de méd. et. de chir. prat., 1884;—Cincinnati Lancet and Clinic, Oct. 12, 1878, p. 269;—Cleghorn, Ep. Dis. Minorica, p. 261;—Doubleday, N. Y. Med. Rec., Mar. 28, 1885;—Ely, N. Y. Med. Rec., Feb. 7, 1885, p. 156;—Gallup, Epidem. of Vt., Boston, 1815;—Jolly, Cin. Lan. and Clin., Oct. 2, 1880;—Lee, Copeland's Med. Dic., N. Y., 1855, Vol. ii;—Lépine, Pneumonie, Wien. 1883, S. 96;—Powell, Lond. Lancet, 1887, Vol. ii, p. 1222;—Renieke, N. Y. Med. Rec., Feb. 14, 1885, p. 188;—Schuyler, N.Y. Med. Jour., Sept. 8, 1883, p. 257;—Stickler, N.Y. Med. Rec., Jan. 26, 1884, p. 85;—Suckling, Lancet, 1886, Vol. 1;—Waller, Inaug. Diss., Erlangen, 1877, S. 4;—Wells, Cin. Lan. and Clin., June 10, 1882;—Wunderlich, Handb. d. Spec. Path.;—et al.

[62] N. Y. Med. Rec., March 28, 1885, p. 343.

[63] Reynold's Syst. Med., Phila., 1880, Vol. II, p. 176.

[64] N. Y. Med. Jour., May 14, 1887, p. 542.

[65] Ibid., Sept. 8, 1883, p. 257.

eratures noted were 99°, 98.6°, and 96° on the second, third and fourth days respectively.

A lady, 44 years of age, was suddenly attacked, at 5 P.M., Nov. 15, 1878, with a severe chill, followed by the ordinary symptoms of pneumonic fever. The entire left lung became consolidated and convalescence was not assured before the eighth day. The highest temperature recorded on each day was: second day, 98.2°; third day, 98.6°; fourth day, 98°; fifth day, 98°; sixth day, 98°; seventh day, 98°, and eighth day, 97.6°.

A robust young man, aged 23, was suddenly attacked by a light chill at 3 A.M., May 7, 1881, followed by the usual symptoms and signs of pneumonic fever, locally affecting the lower lobe of the right lung. Convalescence was declared on the fourth day. The temperature was, first day, 99°; second day, 98.5°; third day, 98.4°, and fourth day 98°.[66]

In another series of cases the temperature was considerably elevated in the beginning but quickly fell to, or below the normal, without improvement in other symptoms.

A young lady, a deaf mute, aged 24, was taken suddenly with a profound chill at 5 A.M., Jan. 29, 1875. The ordinary symptoms of a severe attack of pneumonic fever followed. Headache, sleeplessness, and delirium were prominent symptoms. The upper lobe of the left lung was the part locally affected. Convalescence was declared on the seventh day. The highest temperatures noted were, on the second day 100°; on the third day, 99°; on the fourth day, 98°; on the fifth, sixth and seventh days, 98°.

In yet another series the course of the disease was apyrexial, except on one or two occasions when, for a short time the temperature was elevated.

A widow, aged 60, had had pain in the left side, cough and diarrhœa for a week, when, on April 25, 1881, at 3 P.M., she felt chilly and ill and took her bed. I saw her two hours later. There was noticeable dulness over the lower lobe of the left lung, posteriorly, and in this situation crepitant râles were heard. There was a severe cough, with pain in the left side and a scanty, viscid, white, transclucent expectoration. The appetite was lost and thirst slight. She had vomited once and had a dysenteric diarrhœa. As time passed the expectoration became in turn free, hæmorrhagic, dark, scanty and suppressed. The vomiting continued, the tongue became dry, sordes formed on the teeth and lips and the diarrhœa became frequent, acrid and involuntary. The urine became scanty, was passed involuntary, and finally retained. Her mind, at first acute, became dulled and delirious, and from wakefulness she passed into drowsiness, stupor and coma. Respiration became more and more frequent and embarrassed and she died at 5 A.M., on the fourteenth day. The temperature was on the first day, 96°; second day, 98.5°; third day, 100.6°; fourth day, 99°; fifth day, 98°; sixth day, 98.1°; seventh and eighth days, 99°; ninth day, 98.2°; tenth and eleventh days, 99°; twelfth day, 101.5°; thirteenth day, 101°, and fourteenth day, 101.5°.

In a considerable number of cases the local peripheral temperature was studied, but with, to me, unsatisfactory results. In a large number of cases the affected side was warmer, sometimes remarkably so,[67] than the healthy one, yet in a very considerable number but little, if any, difference could be detected between the two sides,[68] and in some cases the surface temperature was highest on the healthy side.[69]

Jonas and Benczur[70] say that a decided difference in the surface temperature may be noticed by the hand over solid organs—liver, heart, spleen, etc., and the lungs, it being highest over the latter. If they are hepatized, or if there is considerable pleuritic effusion this does not obtain.

[66] This list might be extended, but these are fair examples of the remaining cases.

[67] Anrep, Verhandl. d. phys. med. Geselsch. zu Würzb., Bd. xiv, Heft. 1 u 2;—Larrabee, Jour. Am. Med. Asso., Jan. 19, 1889, p. 110;—Schülen, Virchow's Arch., 1876, Bd. lxvi, S. 109;—Vulpian, La France méd., July 31, 1878.

[68] Wegscheider, Virchow's Arch., Feb. 1877.

[69] It may be that when the ordinary surface thermometer is replaced by a more perfect instrument that valuable information may be derived from investigations in this line. For a consideration of our present knowledge on this subject consult Charcot, Lec. clin. sur les mal. des Vieillards, p. 19;—Fleishmann, Weiner med. Presse, 1876, Nr. 20;—Gubler, L'Union méd. 1857, Nov. 23 et 25;—Homburger, Inaug. Dissert., Strassb., 1879;—Jaccoud, Traité de path. intern., t. i., p. 1032;—Landrieux, Gaz. des hôp., 1875, p. 969;—Lépine, Mém. soc. de biol., 1867, p. 133;—Seeligmüller, Deutsche Arch. f. k. Med., Bd. xx, S. 110;—Wegscheider, Virchow's Archiv., Bd. lxix, S. 172;—et al.

[70] London Lancet, 1889, Vol. ii, p. 971.

SOCIETY PROCEEDINGS.

American Electro-Therapeutic Association.

Second Annual Meeting, held in New York, October 4, 5 and 6, 1892.

WILLIAM J. MORTON, M.D., PREST.

FIRST DAY OCTOBER 4—AFTERNOON SESSION.

(*Continued from page 104.*)

Now let us take a straight glass tube, 50 centimetres long, with a uniform interior cross section of say 1 square millimetre. Suppose the tube filled with a homogeneous liquid whose resistivity is 10 ohms. Then since a block of this liquid 1 cm. long, and 1 sq. cm. in cross section offers ten ohms, a column of the tube 1 cm. in length, having a cross section of 1-100th. of a sq. cm., will offer 1,000 ohms, and the total resistance of the entire 50 cm. column in the tube will be 50,000 ohms. Next suppose that a steady current of one milliampère is forced through this tube. By Ohm's law, the total difference of potential necessary to produce this current will be 1-1000 x 50,000 or 50 volts. While this current flows, there will be will be 50 volts potential difference between the ends of the tube, or a uniform gradient of potential of one volt per centimetre of its length. Consequently, if a unit charge of positive electricity could be placed in a little insulated capsule and introduced within the tube, there would be an electric force exerted upon the capsule of 1-300th, dyne, urging it forward, assuming that the electric force in water is the same as that exerted in air.

It seems to be a general law that the contact of any two dissimilar substances gives rise to an electrification and difference of potential between them. At the surface of contact between liquid and glass, there is an electrification, and once the liquid particles next the glass receive a charge, they are urged along the tube with a force depending on their electrification and on the gradient of potential. If the cross-section of the tube be sufficiently large, the moving electrified particles will tend to set up local convection currents, and the motion of the liquid near the tube's centre may be opposite in direction to that at the walls, but if the cross-section be very small, the whole column of liquid will be urged forward. For any given tube and liquid, the contact electrification of the liquid particles will be definitely established, and the moving force will depend only upon the gradient of potential, which in turn will be directly proportional to the current strength; for if we send two milliampéres through the tube, the terminal difference of potential will rise from 50 to 100 volts, and the gradient will be increased from 1 to 2 volts per cm.

This moving force continually exerted upon the liquid particles will accelerate them until the friction due to their forward velocity balances the moving force. This will determine the rate of electric transfusion through the tube for the particular strength of current employed.

It is evident that the rate of transfusion would not be altered by any change in the length of the tube, for suppose it were increased to 1 metre. In order to sustain 1 milliampère through this doubled length and liquid resistance, we should have to double the terminal difference of potential, and employ 100 instead of 50 volts. The gradient of potential would still be 1 volt per cm., leaving the relation of moving to retarding forces unaltered. Again, suppose that instead of using one tube, we had five similar tubes of 50

cms. length, side by side, and all connected in parallel. One milliampère through the set would give 1-5th of a milliampère through each singly. Also each tube having 50,000 ohms resistance, would demand a terminal potential difference of 10 volts for its share of current, and thus establish 1-5th of a volt gradient per cm. in all. The flow in each would thus be five times less, but since all five tubes are coincidently active, the total transfusion would be the same. If then a porous diaphram be regarded as a framework supporting a collection of parallel capillary tubes, the fact that in actual diaphrams, these tubes would not be all straight, continuous, or of uniform calibre, does not alter the principle or affect the average result. According to this view, the only function of the electric current in cataphoresis, is to establish against the resistance encountered, a gradient of potential, and the contact of the liquid with the solid walls, causes force to be exerted upon the electrified particles, while we have seen that neither the thickness of the diaphram, nor its active surface should affect the rate of transfusion under those conditions; results according to experimental observation.

It was observed by Faraday that water, by contact or friction with other substances, became positively electrified in all the trials to which he subjected it, and its positive nature as an electric was more distinctly characterized than even that of the proverbial cat's skin. This property accounts for the general tendency of aqueous solutions to move from the anode towards the cathode in cataphoresis, down the gradient of electrical potential. Independent observations upon the movements of free particles suspended in glass tubes, filled with liquids, and traversed by electric currents, have supported this view.

It is evident according to the same theory, that for a given diaphram-substance, aggregation-density and size of capillary tubes, as well as liquid within them, the transfusion per coulomb of electricity, or the rate of transfer per ampère, will be directly proportional to the resistivity of the liquid, since on this will depend the fall of potential in the tubes. The higher this resistance of the liquid, the greater must be the electrical pressure between the surfaces of the diaphram to maintain the same current strength, and the moving force upon the liquid particles will be augmented in corresponding measure. The resistivity of the liquid is advantageous in, and only in, the diaphram, for resistance offered to the passage of the current by the liquid masses on each side of the septum, will demand a certain increase in electromotive force to be expended locally in themselves, without any addition to the cataphoric transfer. Consequently the conditions for producing the greatest transfusion with a given number of volt's pressure, would be to place the electrodes as near as possible to the diaphram, on each side of it, so as to develop almost the entire difference of potential within the capillary tubes, and produce the greatest available current strength. The area of diaphram surface involved, does not, as we have seen, affect the rate of transfusion, but only the rate of transfusion per unit of area; so that it might still be independently advisable to keep that active surface above a certain limit, lest the density of current in the tubes might develop too much heat or be otherwise detrimental.

Whenever it is desired to produce the greatest possible transfusion of an aqueous solution of any salt, for a specified electrical transfer in coulombs, or amperehours, the solution should be as weak as possible so as to increase its resistivity, since pure water is almost a non-conductor. When on the contrary, the greatest transfer of the dissolved salt, and not of liquid merely, is needed, a very weak solution is evidently no longer indicated. Wiedemann's experiments on solution of salts, showed that roughly, the transfer of liquid was inversely proportional to the percentage of solid contents. If this were strictly true, the strength of solution would evidently be a matter of indifference, since doubling the solid contents of the solution would just halve the liquid transfer, and leave the transfer of dissolved substance unchanged.

To a first approximation therefore, the strength of solution does not alter the transfer of solid matter per coulomb, and with a given diaphram and solution everything depends on the strength of current. Strictly speaking, however, this rule is far from being clearly defined, for on the one hand, the conductivity of aqueous solutions of salts generally increases more slowly than the percentage of solid contents, so that on this account it would be advantageous to employ stronger solutions for a maximum transfer of salt per coulomb. On the other hand the effect of increasing the strength of solutions upon their contact electrification, is not yet clearly determined, and the loss in moving force on this consideration might in strong solutions more than offset the gain in greater resistivity per solid content, especially as greater frictional forces, retarding the motion might also be looked for. In the experiments of Freund with earthenware diaphrams, the transfusion increased with moderate densities of solution for $CuSo_4$, and $ZnSo_4$, but on the contrary with $Cu(NO_3)_2$ and $Zn(NO_3)_2$, weak solutions appeared to possess the greater transfusive constants.

A large and inviting field seems to be here open to experimental research, for although the theory of cataphoresis appears to satisfactorily explain the facts, the measurements that have been yet made with standard diaphrams and solutions seem all too few.

CATAPHORESIS.

By Prof. Edwin J. Houston, Philadelphia, Pa.

By cataphoresis is meant the introduction of drugs or medicaments into the human body by means of the electric current.

Cataphoresis is dependent for its operation on cataphoric action or electric osmose; or, as the latter is, perhaps, more frequently called, electric endosmose.

Cataphoric action, Porret's phenomenon, electric endosmose, electro-capillary phenomenon, electro-vection, and electro-filtration are sometimes used as synonymous terms.

Since cataphoresis or cataphoric action appears to be a modified variety of osmose, it may be well, before inquiring into the peculiarities of electric osmose, briefly to review the principal phenomena of simple or ordinary osmose.

By osmose, as the term is employed in physics, is meant the unequal diffusion or admixture of two liquids of different densities, through the pores of a thin wall or septum, separating the liquids from each other; two currents are thus established, each liquid tending to flow towards and mix with the other. These two currents are unequal in strength: the flow through the pores of the separating wall or septum towards one of the liquids being greater than it is towards the other.

There results, therefore, a tendency to produce a difference of level in the two adjoining liquids; so that, if, as is generally the case, the two liquids are at the same level at the start, there is soon produced a higher level in that liquid towards which the greater flow is directed.

The phenomena of osmose were first studied by means of a bladder filled with a saline solution, and fitted with a vertical glass tube. The bladder was plunged into a vessel filled with pure water. Under these circumstances two currents were established; one through the walls of the bladder from the water outside of it towards the saline solution it contained, and the other from the solution inside the bladder towards the water outside it.

The inequality in the strength of the two currents thus established is shown by the fact that the liquid mounts to a higher level in the tube than in the outer vessel.

The current flowing from outside the bladder inwards was formerly called the endosmotic current, and that flowing from within the bladder outwards, the exosmotic current.

It was soon evident, however, that these terms lacked any real distinctive character, since, if the saline solution be placed in the outer vessel, and the pure water in the bladder, the direction of the endosmotic and exosmotic currents is reversed.

In order to avoid this difficulty it is now generally agreed to call the endosmotic current that current which is directed towards the higher level, and the exosmotic current that current which is directed towards the lower level.

The phenomena are, however, by some designated by the the simple term osmosis, or by still others diosmosis.

Becquerel has pointed out the fact that as soon as a difference of level has been produced by the action of osmose, a filtration ensues through the separating wall or diaphragm from the higher towards the lower level.

M. Becquerel, on pp. 50–52 of the *Comptes Rendus*, of July 8, 1872, says, as regards the exosmotic current: "We have now some conception of the possible origin of exosmose; it is due partly to diffusion and partly to the filtration resulting from the pressure of the column of liquid resulting from endosmose. I conceive that it was hardly sensible in the experiments of Graham, who operated with large surfaces affording but little elevation to the liquid columns resulting from the endosmose. Dutrochet was right in saying that exosmose transports more of salts than endosmose, as exosmose results partly from pressure, which causes the liquid to filter through with the salt which it holds in solution."

The phenomena of osmose have been carefully studied by Graham who found them to be intimately associated with those of diffusion, or the admixture of fluids of different densities, without the interposition of permeable septa.

According to Graham the rapidity with which diffusion takes place varies with the following circumstances, viz.:

1. With the chemical composition of the fluids, the action in general being most rapid with acids, next with alkalies, and least of all, with fluid albumen, gelatine, and gums.

2. With the temperature; the higher the temperature the greater the rapidity of action.

3. With the degree of concentration of one of the solutions as compared with that of the other.

4. With the difference between the densities of the two solutions; when this difference is constant, the rapidity of action is greater with weak than with concentrated solutions.

A curious variety of osmotic action has been studied by Graham for which he gave the name of dialysis. By its means he showed how crystallizable substances or crystalloids can be separated from non-crystallizable substances or colloids, by means of a porous membrane or diaphragm.

The separation is effected by means of an apparatus called a dialyser, which consists essentially of a glass dish with a bottom of artificial parchment. The mixture of crystalloids and colloids is placed in the dish which is then floated upon pure water. The crystalloids, the molecules of which are as a rule small, readily pass through the pores of the septum while the colloids, the molecules of which are large, remain behind.

If this be the correct explanation, it would seem that a more rapid separation of such substances by dialysis might be obtained by the aid of centrifugal force, by placing the mixture in a separating centrifugal machine, the walls of which are formed of suitably supported septa, placed in a vessel kept filled with pure water.

It would also be interesting in this connection to try whether dialytic separation would not be accelerated by the passage of an electric current through the septum.

The phenomena of osmose are influenced by the character of the septum, the nature of the fluid substances as regards their action on such septum, as well as on each other, the physical conditions of the septum, as regards the dimension of the capillary spaces and their freedom from being clogged, and, to an extent as yet undetermined, by the presence of electrical currents that appear invariably to attend such liquid flow.

Discussion.

BOOK REVIEWS.

INTERNATIONAL CLINICS: A QUARTERLY OF CLINICAL LECTURES ON MEDICINE, NEUROLOGY, PEDIATRICS, SURGERY, GENITO-URINARY SURGERY, GYNECOLOGY, OPHTHALMOLOGY, LARYNGOLOGY, OTOLOGY, AND DERMATOLOGY. By Professors and Lecturers in the leading Medical Colleges of the United States, Great Britain, and Canada: Edited by JOHN M. KEATING, R.D., Colorado Springs, Col., Fellow of the College of Physicians, Philadelphia, etc., JUDSON DALAND, M. D., Philadelphia, Instructor in Clinical Medicine, and Lecturer on Physical Diagnosis and Symptomatology in the University of Pennsylvania, etc., J. MITCHEL BRUN, M. D., F. R. C. P., London, England, Physician and Lecturer on Therapeutics at the Charing Cross Hospital, D. W. Finlay, M.D., F. R. C. P., Aberdeen, Scotland, Professor of Practice of Medicine in the University of Aberdeen, etc. Vol. II. Second Series, 1892. Philadelphia. J. B. Lippincott & Co.

The second volume of this series opens with a good portrait and biographical sketch of the late Dr. David Hayes Agnew. The sketch is from the pen of Dr. John Ashurst Jr., whose former association with Dr. Agnew afforded the opportunity for collecting the most interesting notes. The profession will undoubtedly welcome such biographical articles, and they ought to have a most wholesome and stimulating effect on ambitious young men.

The first two lectures in the section on medicine are upon myxœdema by Drs. D. W. Finley and Thos. Oliver. The first is illustrated by two, and the second by four, portraits of typical cases. They record the good effects of jaborandi, which increased the excretion of urea and the injection into the tissues of freshly prepared juice from the thyroid gland of a sheep.

Dropsy is the subject discussed by Dr. P. H. Pye-Smith, of Guy's Hospital, in a much more satisfactory manner than is usually encountered in text-books. He believes that in acute and subacute nephritis there is an inflammation of the principle lymphatic spaces of the body, viz., the loose connective tissue under the skin, of the air vessicles and interlobular connective tissue of the lungs, and of the cavities formed out of the great pleuro-peritoneal lymph-sac.

The various forms of dropsy and their treatment are presented in a thoroughly scholarly manner.

A very rare clinical study is presented by Dr. James Hendrie Lloyd, in the Philadelphia hospital clinic, in a case of sporadic cretinism. A vivid description is given, and two portraits show a front and a profile view of the patient. The supposition that the drinking of water impregnated with lime is responsible for the pathological condition seems hardly tenable. The case under consideration "grew up in Philadelphia on Schuylkill water." Perhaps it would be well for our quaker brothers to boil their Schuylkill water.

General paresis of the insane, the subject of a brief lecture in Vol. I. by Dr. B. Sachs, of New York, is given a short notice here. Six pages are devoted to the etiology, differential diagnosis and treatment. The only dissatisfying feature is, like that of the first lecture, its brevity. Such important subjects cannot be accorded due consideration in so few words.

Dr. Roswell Park, of Buffalo, presents a case illustrative of the continuous immersion management of lacerated and compound fractures. He keeps the wounded limb for two or three days in a hot, weak solution of mercuric chloride, 1-5000, until a healthy granulating surface shows itself, and then applys the ordinary antiseptic dressing and splints.

Dr. Robert Saundby, of Birmingham, occupies 18 pages in the section on surgery with a valuable lecture on stone in the kidney. The subject is discussed from a medical standpoint, and it should naturally have been placed in the section on medicine. Other peculiar ideas of classification are observable in the locating of Dr. James Tyson's lecture on diabetes mellitus in the section on genito-urinary and venereal diseases, and one by Dr. Charles B. Nancrede on stone in the bladder in the section on general surgery.

Dr. G. M. Lefferts' paper on the treatment of acute and chronic pharyngitis is rather disappointing.

Dr. C. H. Burnett contributes an article on some common forms of diseases of the ear in a way that will be useful to general practitioners. He makes a slip of the pen on page 365 that is surprising in such a careful writer. The types make him say: "A foreign body in the middle ear may be a very simple matter; in fact, it is usually a simple matter so long as it is an inanimate foreign body." Of course he did not mean the middle ear, but the external auditory canal.

It is impracticable, with the space at our command, to give more than a general idea of the character of these lectures by forty-one writers on more than sixty-three subjects, filling 373 pages. There are thirty illustrations, many of which are exceptionally beautiful from a medical point of view, besides eighteen figures.

A few of these clinical lectures never would have been suspected of being such, were they not so labeled. They no more bear the impress of a clinical lecture than do the ordinary papers read before medical societies. Their authors seem to be of the opinion that these publications do not call for their best endeavors, and they content themselves with a few pages of indifferent material thrown unmethodically together. The result is that their so-called clinical lectures do not reflect the advanced thought and practice of our day, and they read like excerpts from some of the musty text-books of the past. The editors should prod them with the reminder that these books are expected to represent their best work and the most modern methods of treatment.

As a rule the lectures are studiously prepared, represent mature experience and are worthy of a place in such a collection. They cannot help but prove exceedingly useful to the mass of the profession—the general practitioners.

A TEXT-BOOK OF THE PRINCIPLES AND PRACTICE OF MEDICINE, for the use of medical students and practitioners. By HENRY M. LYMAN, A.M., M.D., Professor of the Principles and Practice of Medicine in Rush Medical College, Chicago. One hundred and seventy illustrations. Philadelphia: Lea Brothers & Co. 1892.

We may well ask ourselves, in these book-making days, what are the proper requisites of a text-book. Not many years ago a text-book was supposed to, and many did contain all that was then known regarding a particular department of medicine. Increased knowledge in every branch of medicine has served to emphasize the wide discrepancy existing between the actual knowledge on any one subject and that contained within the covers of any one volume. To meet this defect we have had the various encyclopædias, systems, etc., in this country and the ponderous many volumed "hand-books" so much favored by our German confrères. With this wealth of knowledge we must judge the capacity of a text-book writer to-day, more by what he leaves out than by what he puts into his work. Not only has widening knowledge called for a modification of our text-books but methods of teaching have so changed within a few years that of necessity books for the use of undergraduates must be put together on somewhat different lines. The lengthening of professional curricula, the adoption of a graded system, lessening of didactic with increase in recitation work all call for a modification of our text-books. With these preliminary considerations we may ask what characteristics the text-book of to-day should have. It should not be written for the purpose of exploiting the particular news of the writer, especially if he thinks it necessary to support them by argument. It should be a true reflex of the most generally accepted views of the profession. It need not be original. Indeed the days of "originality" in text-book making have long since passed. It should be a symmetrical survey of the entire field which it purports to cover and it should be written in clear, terse English.

With these requisites in mind we may proceed to the examination of this work upon these lines.

The writer has wisely departed from the divisions adopted in our older works on practice, at the same time he has retained a brief statement of the general principles of pathology to serve as an introduction to the special topics. This first part includes some seventy-six pages devoted to a consideration of the following topics: growth and development, regressive disturbance of nutrition, progressive disturbances of nutrition, tumors, disorders induced by disturbance of circulation, contagion and infective diseases, inflammation, fever. It is needless to say that none of these subjects are handled exhaustively, and yet they form an excellent introduction to the special pathology which follows.

We are introduced to special diseases by a consideration of those disorders caused by microscopic animal parasites, which include the intestinal worms, then follow the protozoa, malarial fever and dysentery. Chapter five opens that portion of the work dealing with disorders caused by vegetable parasites, these include actinomycosis, malignant pustule, typhoid fever, influenza, diphtheria, tetanus, tuberculosis, glanders, syphilis, cerebro-spinal meningitis, erysipelas, mumps, rothelu, measles, scarlet-fever, whooping-cough, dengue, relapsing fever, cholera, typhus plague, yellow fever, chicken-pox, small-pox, and hydrophobia. This portion of the work closes with a chapter on the genral management of the infective diseases.

Part three is devoted to a consideration of the diseases of the alimentary canal. Part four, to the liver, pancreas, peritoneum and spleen. This is followed by diseases of the respiratory organs and organs of circulation.

Part seven and eight are devoted to a consideration of the diseases of the blood and nutrition. Diseases of the kidneys and genito-urinary organs are considered in part nine. The remaining portion of the work is devoted to a consideration of the disorders of the nervous system.

A careful perusal of the work will convince the practical teacher that the writer has produced a valuable text-book for undergraduates. It is at once apparent that the writer has mastered the art of literary digestion, and while the best work of the great masters in medicine are presented, yet each chapter bears the stamp of the writer's individual experience as a practitioner. It is, however, from the standpoint of the practical teacher that the value of the work is best shown. Its condensed practical and slightly dogmatic style render it of especial service to the beginner in internal medicine.

BILLROTH and other German surgeons report success in the use of celluloid to replace portions of the skull which have been loosened by injury, necessitating their removal.

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SATURDAY, FEBRUARY 4, 1893.

THE INDEX CATALOGUE.

Our readers will regret to learn that the cheese paring false economists in the House of Representatives, have stricken from the Sundry Civil Appropriation bill, the usual appropriation for the continuation of the great Index Catalogue of the Library of the Surgeon-General of the Army.

No scientific work could possibly be of more value to the medical profession than this, and we appeal to physicians everywhere to use their utmost efforts to have this appropriation restored.

The work which has received the highest commendation from scholars and librarians throughout the world is now near completion, and it would be a source of infinite regret, if the work should fail of completion through parsimonious legislation.

We call on our Indiana brethren to arouse the Honorable Chairman of the Appropriations Committee, JUDGE HOLMAN, to a realization of the great wrong he is perhaps unwittingly inflicting on the medical profession, by his stoppage of the book.

THE ETIOLOGY OF CARCINOMA.

Carcinoma is the most important of all tumors on account of its frequency and its malignancy. Its study from various aspects has consequently produced the bulkiest literature, and to-day the unsolved question of the etiology of this tumor is engaging the attention of investigators the world over. The ancient theory that carcinoma was the local manifestation of a general dyscrasia due to the excess in the body of a certain humor, is now of historical interest only; the humoral theory gave way to the belief that carcinoma was primarily of local origin, becoming general later in its course, and it is unnecessary at this time to enumerate the many clinical and anatomical facts and reasons which have led to the general acceptance of belief in the primarily local origin of carcinoma. In order to explain the origin in loco of tumors in general, COHNHEIM advanced his theory of misplaced remnants of embryonal tissue which may begin to proliferate in a remarkable manner at any time and he defines carcinoma as due to a typical multiplication in an embryonal matrix of epithelial cells with an intrinsic tendency to invade surrounding tissues irrespective of origin and of structure. In this age of biological investigation the misplaced embryonal remnant theory did not long remain unquestioned and undisputed; while it was a very ingenious and broad explanation of the origin of tumors in general. Yet its shortcomings were too many and too serious to pass without notice. Thus it was soon pointed out that it was a purely speculative theory, built upon probabilties; no one was able to demonstrate an actual misplaced embryonal matrix of epithelial cells, for instance, from which a carcinoma might develop; again, embryonal folds, fragments of which might go astray, exist at one time in all multicellular organisms, but nothing has ever been found in the inferior animals resembling a carcinoma although they are stated to be quite frequently subject to various forms of new growths of demonstrative parasitic origin. If all that is essential for a carcinoma to develop is a misplaced fragment of an embryonal fold, it is not clear why invertebrates should be so invariably exempt from such growths as they appear to be. But the supposition that carcinoma might be of parasitic origin was quite uniformly rejected partly because the disease never appeared in endemic or epidemic form, partly because transmission from one individual to another did not occur, and also because the numerous inoculation experiments in animals all appeared to be fruitless. In the meantime, clinical and anatomical facts with an unmistakable tendency towards strengthening the parasitic origin theory began to accumulate. The statistical study of carcinoma showed conclusively that various forms of local irritation played quite a part in the etiology. Quite a number of authentic cases of secondary implantation carcinoma were observed, as, for instance, flat-celled carcinoma of the œsophagus ulcerating and giving rise by implantation to similar tumors upon the mucous membrane of the stomach, or, after perforating the gullet, upon the mucous lining of the deeper bronchi. Then HANA, HAHN, WEHR and others finally succeeded in inoculating carcinoma from man to animals, from animal to animal, and from one part of the body of a carcinomatous patient to another. The discoveries of KOCH led to the search for bacteria in carcinoma by the cultivation method especially, but this was soon practically

abandoned, in part because it became apparent that the various forms of pyogenic and saprophytic bacteria were present solely by accident, but principally because the application of the refined micro-technique of FLEMMING and his followers to the study of carcinoma led almost immediately to the demonstration of bodies which were interpreted as protozoic parasites and during the last few years a whole series of publications have appeared embodying the results reached by ardent investigators in many lands in their efforts to establish animal parasites as the primary cause of carcinoma and other tumors. In connection with this it is very interesting to note that VIRCHOW in 1851 described peculiar cavities in the interior of cancer cells which he considered were formed by endogenous cell division and in this opinion WAGNER coincided. Since 1889 continuous refinement and improvement in technique has aided in the investigation and study of carcinomas for animal parasites, but it was soon shown that in the multitude of new micro-technical methods at command lay possibilities of grave error; intra and intercellular bodies have been described and figured and interpreted as veritable parasites, which subsequent critical re-investigation showed to be in all reasonable probability various forms of cell and nuclear degeneration, or cell inclusions of dead blood corpuscles, or artificial products of the particular staining method employed. The parasites of the earlier investigators in this line, such as NEISSER, DAVIS, WICKHAM, THOMA, SYÖBRING, and many others, were thought by BONEL, KLEBS, RIBBERT, SCHUTZ, WELCH, MACALLUM, and many more to be "pseudo-parasites," including under this term the degeneration products, nuclear fragments, foreign substances, etc. Some investigators, however, believes that among the bodies described there might possibly exist true parasites, and while the quite recent demonstrations of SOUDAKENITCH, STROEBE, PODWYSSOZKI and SAWTCHENKO, RUFFER and WALKER have been subjected to considerable criticism, yet they have received confirmation and approval from numerous sources, and it was even thought that some of these observers had described a certain number of missing stages in the development of the alleged carcinoma parasite. Thus STROEBE, PODWYSSOZKI and SAWTCHENKO claimed that they had discovered falciform bodies in several instances of carcinoma. This claim has already been attacked by METSCHNEKOFF, and we print elsewhere in this issue of THE JOURNAL a communication presented at the last meeting of the Pathological Section of the Chicago Academy of Sciences, by PROFESSOR OHLMACHER, in which it can be seen that he shows quite conclusively that the falciform and other bodies of PODWYSSOZKI and his followers are artificial products due to the use of safranin and iodine or safranin and picric acid in the staining process. OHLMACHER'S work is of importance not only because it annihilates the claims of the investigators mentioned, but also because it pointedly indicates the liability to form wrong conclusions from the appearances produced by the use of some of the rapidly multiplying, new micro-technical procedures and because it shows that safranin and iodine, and safranin and picric acid alcohol must be regarded as unsafe and unreliable combinations. Our knowledge of ultimate nuclear and cellular chemistry and the chemical and physical changes induced in protoplasm by the numerous and complex fixing and staining agents now in vogue, is so extremely limited that it behooves the investigators working to demonstrate the obscure etiological agent in carcinoma and other tumors by means of micro-technical methods to formulate their conclusions only after the most mature deliberation, and after the greatest care has been exercised to elimate all possible sources of error. Indeed it would seem that the fate of SJÖBRING'S parasite at the hands of RIBBERT, of RUSSELL'S organisms at the hands of SHATTOCK and BALLANCE, and of PODWYSSOZKI'S and STROEBE'S falciform and other stages at the hands of OHLMACHER would warn investigators in this field from such reckless announcement of positive results as has hitherto been the case and particularly should this warning be heeded because there is as yet but very little opportunity if any, for control experiments in staining with known pathogenic sporozoa. It is not improbable that among the many forms and bodies demonstrated in carcinoma actual parasites may be found and investigators generally seem to lean to the view that they will come to belong to the coccidia, the same protozoan class which furnishes the organisms in malaria, in coccidiosis of the rabbit's liver, in epithelioma contagiosum of chickens and pigeons, in psorospermic cysts in man, etc., but it really appears that the limit of what can be learned from simple microscopic examination of neoplasms has been reached. The biology of the coccidia must be still much further elucidated in order that a safe foundation for their study as pathogenic agents can be obtained; they must be cultivated artificially in order to enable us to deal with them with the same scientific accuracy as with bacteria; and in the instance of carcinoma it would seem that experimentation would have to be directly along entirely new paths because it has been fully shown that it is only with the very greatest difficulty, and in some exceptional instances that carcinoma can be successfully inoculated into animals, and this would indicate that animals are very largely, as a general rule, immune to the specific cause of carcinoma in the form in which he exists in the growing tumor; whether the organisms of carcinoma, if found outside of the body, will then be demonstrated to be pathogenic in

animals belongs to the problems that future investigation must solve before this obscure chapter in pathology can be fully elucidated.

REMOVAL OF THE OVARIES AS A THERAPEUTIC MEASURE IN PUBLIC INSTITUTIONS FOR THE INSANE.

The State Board of Public Charities of Pennsylvania has recently been induced to take action upon the sexual mutilation of insane women, for therapeutic purposes, which has lately been introduced and practiced in one of the State institutions for the insane. The attention of the Board was directly called to this subject by its Committee on Lunacy, which made a special report upon the subject of "Removal of the Ovaries as a Cure for Insanity." This was accompanied by a statement of opinion as to the propriety of the operation, from the legal member of the board. As it is precisely the legal aspect of this subject which hitherto has been, apparently, overlooked, we will give this brief opinion in full, after making some abstracts from the report of the Lunacy Committee above referred to, a copy of which was directed to be sent, with the unanimous approval of the Board of Public Charities, to the Trustees of the State Hospital for the Insane, at Norristown, Pa. The following note appears upon the office copy of the report:

This action was taken upon a report of the committee's secretary, on Oct. 29, 1892, that four insane cases were seen by him in a separate annex ward of the Norristown Hospital which were just rallying from the operation of oöphorectomy, performed there by Dr. Joseph Price, in consultation with Dr. Alice Bennett, with the consent of the Hospital Trustees.

It was further intimated that fifty cases had been already marked for operation, by this method, in the wards of the same institution.

The committee's report states that modern advances in abdominal surgery have greatly stimulated operations within the pelvic cavity, and that surgeons and gynecologists are now enabled to remove the uterus or ovaries with facility and relative safety. It also refers to the fact that the operation of oöphorectomy has been performed, both in this country and Europe, in cases of mental disease thought to originate in, or be maintained by, diseased or disordered states of these organs, in the hope that the mental and physical diseases would be cured. In this country, these operations upon lunatics have been, with few exceptions, confined to private practice, or to general hospitals; but only very recently the trustees of the State Hospital for the Insane, at Norristown, have set apart a separate building for such purpose, and several insane patients there have already had their ovaries extirpated. In general practice, these operations have been very frequently performed for the relief or cure of many forms of uterine and ovarian disease and functional disorder, including those nervous and mental maladies which appear to depend upon, or to be otherwise aggravated by, such local conditions. The increasing frequency of these experimental mutilations and their doubtful ultimate success, have caused conservative medical opinion to halt and to dispassionately discuss the whole subject, and to inquire not only into the immediate, but also the future results of such operations. The medical literature and statistics of the subject are relatively scanty, compared with the large number of operations performed, which is, in part, due to the difficulty of keeping the subjects under observation for years afterward, as it is absolutely necessary to do in order to arrive at the positive results. Many insane, epileptic, and hystero-epileptic women, who have been thus mutilated, have subsequently found their way into hospitals for the insane, and are heard of no more. This is also the case in many instances where insanity has *resulted* from this operation, which is by no means an unusual occurrence. Those whose duty it is to care for the insane in institutions are familiar with these ultimate failures, whose last condition is worse than the first. As a rule, to which there are but few exceptions, medical superintendents of hospitals for the insane now regard with disfavor the castration of women as a cure for mental disorders, even in those cases where there appears to be some causative or irritative connection, or sympathy, between the disordered brain and the ovaries. From whatever physical disorder the insanity may have developed originally, or may be aggravated by, the centers of the brain and spinal cord undoubtedly receive, early in the pathological change, such a profound impression as will persist long after the removal of the alleged offending organs.

Extirpation of the ovaries in lunatics is only practiced as a last resort, after every other expedient has been unsuccessfully tried, and in such cases the brain and cord have doubtless become permanently altered, or impelled to disordered action, and functional, if not organic, deterioration has taken place. It is to these nervous centers, diseased or disturbed as the case may be, that we must look in such cases for the real focus, or irritating influence; and we learn, by the abundant examples of failure, not to hope for the relief of a central lesion by the removal of distant organs, even though these may *appear* to periodically aggravate the mental condition. The ovaries of insane women, it is true, sometimes present such gross forms of disease as to absolutely demand extirpation, and the Committee makes no objection to the operation, where gross lesions exist, or when life is obviously in danger. Allusion is not here made to such exceptional cases; but it has been lately recommended and practiced where the mental disorder only

appeared to be more or less influenced by the generative apparatus. "In such cases," says the Committee, "in our opinion, this operation is not justifiable. As a general rule, to which there must be an occasional exception, we are forced to regard experimental operations upon insane women, for the purpose of restoring their reason, with disfavor, and to consider it unwarrantable and indefensible. As to the practice of such operations in our State hospitals, it is a matter of grave doubt whether a relative or guardian of an insane woman has the moral or legal right to give consent to the unsexing of the insane person, whose power to give or withhold consent is temporarily or permanently in abeyance. What redress would such a person have, if, in recovering her reason, she objected to her mutilated condition?" This, at once, brings up the question as to the personal rights of the insane, and an opinion being requested from the legal member of the Committee, MR. THOMAS W. BARLOW, he wrote as follows:

I am of opinion that the operation of oöphorectomy upon insane women, as recently practiced and as proposed to be practiced in one of our State Hospitals for the Insane, unless necessary to save life, is not only illegal, but, in view of its experimental character, it is brutal and inhuman, and not excusable on any reasonable ground. To quote a learned medical opinion: "To operate on organs not diseased for the relief of undefinable symptoms, hysterical symptoms, and epileptic symptoms, is unwarranted." A lunatic cannot give a legal consent to the performance of an experimental operation. Nor can her relatives legally give such a consent in her behalf, and therefore a surgeon practicing oöphorectomy upon an insane woman, unless to save life, takes a great risk. He may take the risk of a criminal prosecution.

It is regarded by the best medical authorities as a useless and improper expedient for the cure or relief of insanity, and the operation of oöphorectomy in a public hospital upon indigent insane women must be regarded as largely experimental, and for that reason is bound to reflect upon hospital authorities now boasting of modern humane methods.

The Committee on Lunacy of the Board of Public Charities has full authority under existing statutes to prohibit the performance of such operations. It is the duty of this committee to "regulate the treatment of the insane," and this, whether it involves the restraint used, the character of food furnished, or the medical and surgical methods exercised in their behalf. The zeal of the gynecologist is being carried to an unusual extent when it proposes to use a State Hospital for the Insane as an experimental station, where lunatic women are to be subjected to doubtful operations for supposed cures. If it is to be permitted in some forty or fifty cases, as proposed, it might be well to practice the experiment upon the entire female lunatic population, so that the gynecologist may have the large opportunity he doubtless craves to see just what would happen. At the expense of some lives, the continued and aggravated insanity of most of his subjects, with a few supposed cures and improvements, he could read his conclusions learnedly to his gynecological brethern, with the resultant added forward movement up his ladder of fame.

Dr. Wharton Sinkler, in a paper recently published in the *University Medical Magazine*, and which he read before the Association of American Physicians, in September, 1891, says, "as to the benefits derived by patients who have undergone oöphorectomy for insanity, epilepsy, hysteria, and the different forms of neuralgia and nervous troubles, the opinion of different observers varies to such an extent that we might believe that totally different beings and conditions were considered. Certain writers give the most glowing accounts of the benefit obtained by almost every patient operated upon, while others regard the result as being always so unfavorable that the operation is never justifiable."

All of which proves that the operation is wholly experimental, of great uncertainty, and of very doubtful expediency.

This is the operation that it is proposed to make upon a large number of indigent insane women.

As a member of the State Board of Charities, I deem it to be my duty to protest against such a proceeding, and, as the legal member of the Committee on Lunacy, I pronounce it to be illegal and unjustifiable.

This, to the gynecologists may seem like an unwarrantable interference with questions which they alone are competent to decide. When it is remembered that the report is from the pen of the distinguished chairman of the Lunacy Committee, DR. THOMAS G. MORTON, who has been for many years upon the surgical staff of the Pennsylvania Hospital, the character of the opposition to this innovation in the treatment of insanity may be appreciated. If this were not sufficient, however, the opinion of MR. BARLOW should make future operators cautious before assuming the legal responsibility of castrating helpless and mentally afflicted patients in public institutions, who, even if they should recover their reason, might properly object to their mutilated condition.

Some of the pioneers in gynecology are also protesting against the abuses of oöphorectomy. PROFESSOR GOODELL in the main agrees with DR. MORTON in the points made, and declares that "the whole business of removing the ovaries has been horribly abused;" and "was glad that DR. MORTON had taken such a firm stand in this matter." DR. JOHN B. CHAPIN, Superintendent of the Pennsylvania Hospital for the Insane, and President of the Association of Superintendents of American Hospitals for the Insane, expresses much satisfaction and gratification which he experienced on reading the preceding paper. He thanks the Committee and State Board for coming forward to exercise the powers of their office to save the hospitals and the profession from what threatens to become a scandalous proceeding. "To erect a hospital, or propose one, where women were to be castrated in companies of fifties, with the hope of a cure of insanity, would be generally regarded, in the present state of meagre knowledge upon the subject, as revolting." . . . "In a case in England, DR. ROBERT BARNES declined to perform the operation without the consent of the Commissioners of Lunacy." . . . "Hospitals for the insane might easily lose a portion of the slender hold they now have upon the public and friends of patients, if it were understood that the patients were subjected to experimental operations of hazardous nature."

On the other hand, DR. JOSEPH PRICE has published a letter, denying either the brutality of the operation, or that it is, in selected cases, experimental in its nature. He construes it all as a personal attack upon DR. ALICE BENNETT, and as intended, indirectly, as a condemnation of her course in this matter. This appears, to an impartial out-

sider, as an attempt to side-track the main question, and to belittle the important interests under consideration. DR. MORTON says that insanity is not a disease of the ovaries, nor of any other part of the body which is accessible to the surgeon's knife, and MR. BARLOW says that legal consent of the patient for such mutilation can not be obtained.

DOMESTIC CORRESPONDENCE.

Government Cheek.

We hardly ever go to the postoffice without finding a letter or a circular from some firm who is anxious to instruct us in the practice of medicine. Each letter has advice as to what remedy is best to give in certain maladies, and we are told that these remedies are giving wonderful results and the greatest satisfaction. If all we are told in these circulars and letters is true, the medical schools had just as well close up shop and quit business. I am confident that I have received letters describing the treatment of nearly all, if not quite all, the diseases that the human family is subject to, and these letters tell us how to cure consumption, cancer, and other maladies, that we had been taught were incurable. It may seem that we are ungrateful if we do not appreciate all this kindness, and I must not forget to say that most of these firms propose to furnish us with a sample bottle of their medicine, with directions free, if we will only pay express charges. Think of it, a remedy for any disease, free of charge.

Now, all I have to do (if these firms are telling the truth) is to find the cases and give the medicine. They will do the rest. I have always thought that we lived in a great and glorious country, and that people were liberal hearted to some excess, but I had not believed before that there was a class so liberal hearted as to give away such valuable information and such grand remedies. I had thought that when man learned to cure all manner of diseases they would first make a fortune out of their wonderful discoveries, and then give the formula to less favored individuals, but not so. To-day, when a firm learns that a certain compound will cure a certain malady; they make up large quantities of it, bottle it up nicely, learn the names of all the poor country doctors, and write them all about the remedy, where it was discovered, the great number of people who use it, and propose to give each doctor a bottle, who, if he is not sick himself, can give his bottle (or if he is not liberal, sell it) to some one who is sick, and thereby increase his reputation and wealth. All this liberality makes us sorry that we had lost so much time and money in trying to learn something about disease. If I had only waited until this year and put out my shingle, all I would have had to do, would be to read the mail matter that these liberal firms send me, and write them word to send me the medicine. (The patients themselves could have told me what was the matter with them.) Just think of it, nothing to do but answer letters. A few stamps and a few sheets of paper would be all the capital I would have needed to start with. I could have made money from the start. Most of my remedies would cost me twenty-five cents (express charges) and I could sell them for a dollar, and in a few months I could go it wholesale and soon be a Gould—but being an old fogy, I let the medical schools, instrument maker and drug stores "do me up," now I am a century behind, and men are *giving* the profession all they need. Woe, is to me and my fellow practitioners, who are so far behind, so foolhardy and selfish as not to accept all these good things.

Now, Mr. Editor, I am sick and tired of these kind of gentlemen. The last one who wrote me said that he did not presume to dictate to me what remedy to use in any disease, but he had a wonderful remedy for young girls who were tardy about menstruating. I would love to know how to get rid of these kind of gents. Advertising them in any way, would be the thing they want. If you can suggest any remedy through THE JOURNAL, you will be a benefactor. Doubtless you are bored to some extent with these same kind of gentlemen. If no other plan will do, I would suggest that at the next meeting of the Association, a resolution be passed condemning the prescribing of any advertised remedy, whose formula is not known to the prescriber. These gentlemen need a little of their cheek knocked off of them, and if the Association will condemn their practices they will probably reform. Very respectfully,

Oran, Mo. W. D. HOWLE.

"Collateral Associations."

To the Editor of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION:

Sir:—Referring to the editorial on "Collateral Associations" in your issue of January 21, I may be permitted to remind you that for several years I have been advocating the very subject of your writing—the encouragement and facilitation by the American Medical Association of the meeting of these collateral organizations in connection with its own annual session. You say these "societies would very greatly enhance their own usefulness and prosperity by arranging their place of meeting to correspond with the same place, and either the week before, or after, that of the American Medical Association." But very few men in the profession can afford to sacrifice the time or incur the expense of two continuous weeks of attendance as you propose. The American Academy of Medicine has tried the experiment of meeting on the Saturday and Monday immediately preceding the meeting of the American Medical Association, but the intervening Sunday has shown the very decided objection to this course. To attempt to meet on the Saturday and Monday succeeding the adjournment of the American Medical Association would prove even more objectionable, since under present circumstances a large proportion of the members of the Association do not remain for the last day of the session on Friday.

The arrangement which I have advocated, and which I still believe the only one practicable, is for the Association to hold its sessions on Wednesday, Thursday, Friday and Saturday, leaving Monday and Tuesday not only for these collateral associations, but for its own standing committees—the Board of Trustees, the Committee on General Business, the Judicial Council and the Executive Committees of the Sections to prepare, with proper deliberation, the work which can now only be done hastily and in a makeshift fashion, during the intervals of the general sessions or at the sacrifice of attendance upon the latter or the Section meetings. A further considerable advantage will be the opportunity for preliminary registration, so that upon the formal opening of the session, if on Wednesday, the heretofore impossible spectacle may be witnessed of the assembly of the great body of the Association prepared to listen to the address of the President. Moreover, it has not unfrequently occurred that important questions have presented themselves on which delegates, who alone are entitled to vote and then only after having been duly registered, have not hesitated to act, although they have not yet been able to register—an unpardonable inconsistency in a body so tenaciously insistent upon the strictest conventionality. I am confident, were the experiment tried, that the assignment of Monday and Tuesday for all work

foreign to the general sessions of the Association, would so expedite its business that Wednesday, Thursday and Friday would actually suffice for the general addresses and Section papers and discussions, and leave little for Saturday beyond the formality of adjournment.

The collateral associations you enumerate—the American Academy of Medicine, the American Medical College Association, the American Medical Temperance Association, the American Microscopical Association, the Association of Military Surgeons of the National Guard of the United States, the Association of Railway Surgeons, and others, as the American Climatological Association, the American Health Resort Association, the Association of Acting Assistant Surgeons, etc., are in no sense antagonistic to the American Medical Association, while their purposes are such as do not come within the scope of, or permit their absorption by, any of the eleven Sections of that body. You state: "It is no exaggeration to say that nine-tenths of the members of these organizations" [referring to only two of them], belong to the American Medical Association. Hence, it is easy to see how desirable it is to them that they may be able to save time and money by such a concentration of meetings as suggested."

The certain result would be to transfer their entire membership after their adjournment on Tuesday night, to the American Medical Association on its meeting the following (Wednesday) morning. The danger now is that the community of interest among the members of these several minor bodies may prove so attractive that they may prefer to attend them to the neglect of the older body, or, as in 1889, when the American Climatological Association met on the Monday and Tuesday of the week of the American Medical Association's meeting, members shall be compelled to elect whether to sacrifice attendance upon the last day of the one or the first day of the other, both thus suffering a loss, which need not have occurred had the American Medical Association begun its proceedings on Wednesday.

I have, however, so often presented these views in the Association that I am quite willing to leave the solution of the question to the course of events. Those who earnestly wish to see the American Medical Association become greater in its membership and influence, cannot but agree with your statement respecting the "focalization" of the collateral National medical organizations that "in a unification of work and purposes will be found the greatest good to the greatest number."

ALBERT L. GIHON, M.D.

145 E. 21st St., New York City.

Asepsable or Aseptizable.

To the Editor of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION:

In a recent issue of THE JOURNAL appeared a note from a firm of instrument manufacturers, asking for a word to describe the character of instruments which were susceptible of being rendered aseptic, in order to conform to the requirements of modern surgery. I would suggest "Aseptizable" in preference to "Asepsable," because the verb *aseptiser* is already used in French surgical books and "aseptisable" or "aseptizable" in English would be in harmony with continental usage, and therefore should be preferred to the entirely new word. Moreover, we shall soon be employing the verb "aseptize" to describe what is to be done to the instruments before operating and perhaps also the noun "aseptization" to express the result of the procedure.

MISCELLANY.

THE INTERNATIONAL CONGRESS OF CHARITIES, CORRECTION AND PHILANTHROPY, JUNE 12–18, 1893.—*Sub-Section on the Training of Nurses.*—In accordance with the general program of the Section, Nurses will take part in the general session and in two sectional meetings, and will hold in addition three separate meetings—June 13, 14, and 17.

For these three separate meetings papers on subjects of special interest to Nurses will be prepared and discussed. The following are suggested as subjects to select from:

Training Schools in England and America. Proper Organization of Training Schools. Nursing in Infirmaries and Almshouses. Nursing of the Insane. Obstetric Nursing. Nursing of Infectious Diseases. Nursing in Sanitoriums and Home Hospitals. Private Nursing. Nursing by Religious Orders. Work of Graduate Nurses.

All communications relating to this portion of the work of the Section should be addressed to

MISS ISABEL A. HAMPTON, *Chairman*,
The Johns Hopkins Hospital,
Baltimore, Md.

AMERICAN SURGICAL ASSOCIATION.—The preliminary program for the meeting to be held at Buffalo, N. Y., May 30, 31, and June 1, 1893, is as follows:

President's Address.

1. The Modern Treatment of Compound Fractures. By Dr. Nicholas Senn, Chicago. Discussion by Drs. Roswell Park and F. S. Dennis.

2. Hypertrophies and Degenerations of Cicatrices and Cicatricial Tissue. By Dr. J. Collins Warren, Boston. Discussion by Drs. C. H. Mastin, G. R. Fowler and W. H. Carmalt.

3. Surgery of the Gall Bladder. By. Dr. M. H. Richardson, Boston, Discussion by Drs. J. Ewing Mears, A. Vander Veer, W. H. Carmalt, and Theo. A. McGraw.

4. Surgery of the Rectum. By. Dr. A. G. Gerster, New York. Discussion by Drs. L. S. Pilcher, H. H. Mudd, and L. McLane Tiffany.

5. Surgical Treatment of Cervical, Thoracic and Abdominal Aneurism. By Dr. C. B. Nancrede, Ann Arbor. Discussion by

6. Surgery of the Prostate. By Dr. J. William White, Philadelphia. Discussion by Drs. Hunter McGuire, T. F. Prewitt, R. F. Weir, and F. H. Gerrish.

7. Treatment of Carbuncle. By Dr. F. Lange, New York. Discussion by Drs. Robert Abbe, J. B. Roberts, and J. S. Wight.

In addition to the above specially selected subjects, the following papers have been offered:

1. Unreduced Dislocations of the Astragalus. By Dr. Stephen Smith, New York.

Fellows who propose to present volunteer papers are requested to send to either of the undersigned the titles of their proposed papers as soon as possible, in order that they may be properly classified and arranged for the final program.

Fellows are also requested to notify the Chairman of the Committee whether they will take part in the discussion upon any of the special subjects given in the above list.

NICHOLAS SENN, *President*,
J. R. WEIST, *Secretary*,
J. EWING MEARS, *Recorder*,
F. S. DENNIS,
JOHN S. BILLINGS,
Business Committee.

OFFICIAL LIST OF CHANGES in the Stations and Duties of Officers Serving in the Medical Department, U. S. Army, from January 21, 1893, to January 27, 1893.

Capt. Freeman V. Walker, Asst. Surgeon U. S. A., is granted leave of absence for four months, on surgeon's certificate of disability, on condition that he spend the period of leave as a patient in the Army and Navy General Hospital, Hot Springs, Ark.

OFFICIAL LIST OF CHANGES in the Medical Corps of the U. S Navy, for the Week Ending January 28, 1893.

P. A. Surgeon W. F. Arnold, detached from U. S. training ship "Richmond," and granted three weeks leave of absence.